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USSR Report

MILITARY AFFAIRS

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JPRS-UMA-84-031

11 April 1984

USSR REPORT

MILITARY AFFAIRS

CONTENTS

ARMED FORCES

OUTSTANDING COMBAT DIRECTORATE OFFICER PROFILED

Moscow KRASNAYA ZVEZDA in Russian 21 Feb 84 p 1

/Maj V. Rybakov: "A Combat Directorate Officer"/

/Text/ The command post was totally absorbed in the battle. According to reconnaissance information, the "enemy" was preparing a massive strike. His years of experience suggested to Lt Col V. Voronkov that the "enemy" most like would actively use diversionary tactics and fly at various altitudes. He did not rule out the use of jamming.

Vladimir Aleksandrovich took the hallf of the combat directorate in at a glance. It was in semidarkness and combat crew specialists were at their duty stations.

"The officers are ready to work," Voronkov noted to himself. Each of his subordinates in these instances epitomized self-discipline and attention. A group of specialists headed by Officer A. Kotlayov were calculating navigational headings to intercept aerial targets. Officers D. Butorin and G. Shalin were communicating with coordinating subunits. Information was flowing in to Voronkov.

The lieutenant colonel checked information on the aerial situation as laid out on the visual display board. The board was marked with different colored lines depicting the flight lines of targets. One needed extensive specialized knowledge and considerable practical experience to read this "battle book" without error, to effectively analyze and make a competent decision. The pilots' victory in battle depended on this. An error here on the ground could eliminate the pilots' ability to complete their mission.

Voronkov worked out the "enemy" plan to break through to the protected objective at the airplane "ceiling" under cover of intense jamming. Now the first lights from the targets began to approach the zone. It was time.

"Comrade colonel! Lieutenant Colonel Voronkov reporting...."

And the interceptors taking off broke the airports' silence with the thunder of their afterburners.

It is possible to anticipate, competently and thoroughly evaluate an aerial situation and quickly work out a decision only on the basis of exact calculations

and with the ability to grasp and analyze a large volume of information in an abbreviated time frame. This is the essence of the character and the features of Lieutenant Colonel Voronkov's successes.

The officer has over 20 years of aviation experience and hundreds of hours in front of a radar screen behind him. And he himself could not immediately tell you how many interceptor targets he has vectored. There is definitely a reason for him being considered one of the best officers in the combat directorate.

Characteristic traits of Lieutenant Colonel Voronkov are tireless energy, thoroughness, and optimism. He feels that one should work with maximum efficiency.

He is able to excite and inspire people and it is no accident that Voronkov's crew is noted for its friendship and solidarity. This feeling of fellowship helps them to understand one another with just half a word when they have to resolve complicated missions under severe time constraints and instantly weigh the pros and cons.

The commander as a rule accepts Lieutenant Colonel's Voronkov's report with practically no correction. Then, when a decision has been reached, it is important to implement it. So it was this time. The "enemy" was theoretical, but there can still be no indulgence in battle.

The "enemy" was destroyed at the far reaches. And this was as it should be, because the business of defending our Motherland's borders is in the reliable, experienced hands of such officers as communist Lieutenant Colonel Voronkov.

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CSO: 1801/232

ARMED FORCES

'I SERVE THE SOVIET UNION' TV PROGRAM GETS HIGH RATING

Moscow KRASNAYA ZVEZDA in Russian 7 Feb 84 p 4

/Maj M. Zakharchuk, KRASNAYA ZVEZDA correspondent: "The Search Continues"/

/Text/ One day freshmen at the Kharkov Guards Senior Tank Commander School imeni Supreme Soviet of the Ukraine SSR were asked how they had decided on their vocation. One third of the cadets in their answers referred to the television program "I Serve the Soviet Union" as prompting their selection of a life-long path.

But not only secondary school graduates watch this program about the army. Without exaggeration, the whole country is its audience. People of all ages and professions listen for the invitational sound of its fanfare every Sunday. You become convinced of this when you see the Central Television mail. From the volume of mail from television viewers, the program "I Serve the Soviet Union" is very likely one of the top shows. It has gained the solid respect of millions of viewers.

It began in the early 1970's from the usual full-length documentary films which did not always gain the public's attention. Thus it had to be restructured.

The program began by looking for a form for presenting material. The program's authors (who without a doubt saved everything good that had been found and discovered to that time) resorted to a style reminiscent of very popular magazines. This gave them the ability to closely combine operational information with actual reporting and artistic material. It goes without saying that television transformed the printed material through the use of electronics, special effects, etc. Even more important is the fact that the political and social content of programming increased sharply in its scope and attained clarity, while the genre and thematic diversity increased. The program's shape, integrity and rhythm, i.e., its creative force, began to crystallize.

Currently, there are many lively, interchangeable segments, such as "Our Movie Theater," "Radar," "On the Globe," "Your Motherland," "Art For the Solider," "Our Reporting," "The Training Ground," "Sports, Sports, Sports..." and many others. Obviously with such television programming diversity it is not easy to devote the whole hour of the program to a particular semantic core. But this is what will primarily bring serious successes for the journalists. Let us look at the "On This Day 40 Years Ago" segment to confirm this opinion.

This series, planned for 2½ years (the final program is slated for 9 May 1985) appears on "I Serve the Soviet Union" every Sunday. In the more than 50 programs television reporters have talked about the battles of Stalingrad and Kursk, about liberating the Caucasus, the battle for the Dneiper and the lifting of the seige of Leningrad. Numerous veterans of the Great Patriotic War who have taken part in the program frequently appear on the very location of that battle. The heading "On These Days 40 Years Ago," which is prepared on a high publicistic note, is the very core of the program and gives all the segments a patriotic flavor.

One must add that the segment was appraised at its own true worth by both the press and television viewers. Since it began, departmental mail has doubled. Here are a few excerpts from some letters. "Every time I watch your program it seems that all I have to do is reach out my hand to be able to touch my own youth," says N. Goncharova of the city of Taganrog. "I am forever thankful for this program. I looked for it for a long time and I believe that all veterans of the front waited for it," from L. Antonov of Svetlogorsk, Kaliningrad Oblast. "Dear comrade television reporters, I would like to say that you are fulfilling a major state function. You are indoctrinating us, the youth, with the sacred feeling of gratitude for those who won the great victory," K. Vostrotin, Bryansk.

Indeed, when they were shown, the series of programs for the Novosibersk Military Political Combined Arms School imeni 60 Years of Great October and the numerous television reports since BAM /Baikal-Amur Magistral/ and the TV reports on training in "Bratstvo po Oruzhiyu /brothers in arms/-80," "Zapad /West/-81" and "Shchit /Shield/-81" were highly acclaimed. Certainly there were errors in these programs. All the same, on the whole each one of them was considered a total production because they showed all aspects of the topic in question.

It is especially worth noting the great amount of mass-appeal work which is being done by the "I Serve the Soviet Union" TV journalists. In just the last 2 years they have organized meetings with listeners of the "Vystral" courses, pilots from the Order of Lenin Moscow Military District, military engineers, soldiers of several divisions, and BAM construction workers. The material on these meetings afterwards serves as a good base for preparing the program itself.

We also note that Soviet military commanders, distinguished political workers, and veterans of the Great Patriotic War regularly appear on the program.

This program recently celebrated its 10th anniversary. Alot has been accomplished in that period. It is enough to say that only last year the military-patriotic department of the Main Propaganda Editorial Board for Central Television prepared more than 50 segments of "I Serve the Soviet Union." Each program appeared on two channels. If you add here the monthly programs "You Remember, Comrades" and "Movement Without Danger," which are also prepared by the military-patriotic department, it becomes clear that television journalists have a lot of propaganda work. It is primarily for this reason that they ought not to rest on their accomplishments, but should continue searching for new forms and methods of showing life in the modern army and navy. They must also more decisively eliminate the monotony, facelessness, descriptiveness and cliches that are still seen in their work. Material from the 26th CPSU Congress states that

"every television and radio program must be seen as a serious discussion with people who expect not only an upright and effective accounting of facts but also a thorough analysis of the them and a serious summary.

I would also like to express the wish to television journalists that they continuously and actively use the purely television methods and ways of working and the rich capabilities of electronic technology as it was used, let's say, in the television film "The Arc of a Large Circle." This program was devoted to the flight of the Chkalovskiy crew on its Moscow-North Pole-U.S. route. The military-patriotic collective headed by USSR Journalist Union prize laurette M. Leshchinskiy still has untapped reserves for creative growth.

I would like to conclude this article with an excerpt from a television review which PRAVDA dedicated to the program "I Serve the Soviet Union." "There is a special hour in the Sunday routine when television screens in hundreds of barracks are lit up. This doesn't happen everywhere at 10 am, since many army garrisons aren't close to Moscow. But, breaking time zones, the great wonder of television is uniting soldiers."

12511
CSO: 1801/232

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Moscow VOYENNYY VESTNIK in Russian No 1, Jan 84 (signed to press 29 Dec 83) p 1

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In Foreign Armies

12697
CSO: 1801/238

ARMED FORCES

PARENTS WHO ABETTED DRAFT DODGERS REPRIMANDED

[Editorial Report] Tbilisi KOMUNISTI in Georgian on 13 December 1983 page 2 carried D. Gergishvili's 1,500-word report on the Qvareli Rayon Party Organization Conference, which discusses pluses and minuses in all aspects of social and economic life. Economic problems included poor discipline, low productivity, high manual labor, avoidance of social labor, the pursuit of lucrative crops instead of grapes, and the slow adoption of the brigade contract method. Public education was faulted for poor social discipline and internationalist and military-patriotic indoctrination, exemplified in particular by the fact that the raykom buro had to reprimand (with entry onto party cards) communist parents in two families who tried to help their sons avoid military service. Other negative phenomena insufficiently dealt with included persistent "outmoded traditions and rituals" and extortion practiced by certain administrative organ personnel.

CSO: 1813/832

ROLE OF SOVIET MORTARS DISCUSSED

Moscow ZNAMENOSETS in Russian No 11, Nov 83 p 5

[Article by Gds MSgt (Res) A. Akin'shin, full bearer of the Order of Glory: "With High Trajectory Fire"]

> [Text] A. V. Akin'shin's combat biography began at the distant approaches to Stalingrad in a 120-mm mortar battery of the 289th Guards Rifle Regiment. As a member of a section, Aleksandr Vasil'yevich participated in the battle on the Kursk Salient and made an assault crossing of the Dneiper. He fought the enemy in Roumania, Poland, and Germany. He greeted the long-awaited victory in Czechoslovakia. Among his combat decorations with which his combat path is marked is the Order of Glory with three degrees.
>
> Guards Master Sergeant (Reserve) A. V. Akin'shin tells of how the mortarmen smashed the enemy and of the high combat qualities of this weapon.

Much links my life with the mortar. The "samovar pipes," as the infantrymen sometimes jokingly called them, possessed many remarkable qualities: high rate of fire, comparatively low weight, constant readiness to open fire without special preparation, simplicity of combat employment, and ease in preparation for action. Within the tube, for example, there is no need to make complex and accurate rifling as, let us say, in an artillery piece. The necessity for such difficult parts as the breechblock, counterrecoil mechanism, and equilibrator also disappers.

All these qualities also made the mortar a truly mass weapon. During the years of the Great Patriotic War about 348,000 various mortars were produced in our country. The industry of Hitlerite Germany produced 68,000, that is, five times fewer.

By the start of the war we had created an harmonious system of mortar armament which consisted of the company--50-mm, battalion--82-mm, regimental--120-mm, and pack--107-mm mortars. They were all developed under the direction of the famous designer, B. I. Shavyrin.

A. V. Suvorov often said of his "wonder-heroes": "The soldier can go where the deer goes; the battalion can go where the soldier goes; and the army can go where the battalion goes." During the days of the war, this Suvorov saying was applicable to the mortarmen: "The infantryman can go where the deer goes; the mortarmen can go where the infantryman goes; and the battery can go where the mortarman goes."

The 50-mm company mortar which was in our army's inventory until 1943 had a weight of 10.5 kilograms and one soldier carried it on his back. The range of fire was 800 meters. For comparison: the German mortar of the same caliber was twice as heavy and it sent a mortar round 300 meters closer. The superiority of Soviet models of artillery weapons was demonstrated in this as well as in much else.

On the march, the 82-mm battalion mortar was broken down into three parts--the tube, bipod mount, and base plate--each of which was carried by a member of the section. So that the battalion mortars also moved directly with the rifle subunits. They were successfully employed as part of tank-borne troops. The sections were located on the armor of the combat vehicles together with submachinegunners.

And it should be stressed again that the Hitlerite 81.4-mm mortar with the same weight as the Soviet mortar--56.5 kilograms--had a firing range 700 meters shorter.

You are far from able to carry away my "own" regimental 120-mm mortar in the disassembled form too--after all, it was more than a quarter of a ton of metal. In return, the 36-pound mortar round which was fired from it destroyed targets at a range of 5.7 kilometers.

There were no such powerful mortars as our 120-mm mortars in the Hitlerite Wehrmacht at all at the start of the war. The fascists organized their production only in 1942, having copied the Soviet model.

Thanks to its combat qualities the mortar was always located close to the infantry and supported it with fire. It was rightly called the first assistant to the "queen of the battlefield."

One of the primary missions of the mortarmen in battle is the destruction of enemy personnel and weapons. Thanks to the powerful fragmentation effect of the mortar rounds and the mortars' high rate of fire we accomplished these missions successfully both in the offense and in the defense.

...The battle took place for a height which dominated the terrain on which the Hitlerites had dug in. They conducted intensive fire against the Soviet men and did not permit them to rise up for the assault. When our battery fired the first salvo, the enemy fell silent. The fascists tried not to jut out from the shelters, although this did not save them from the death-dealing fragments, either. We changed over to rapid fire. Each mortar "kept" 12-15 rounds in the air, that is, during the first round's time of flight to the target the section managed to fire 12-15 rounds.

After such a working-over of the enemy position, the riflemen occupied the hill quickly. About 100 corpses covered its slopes.

With certain experience and coordination the mortarmen achieved a high accuracy of fire. The battle at Stalingrad is recalled. Our section was assigned the mission to hinder the fascists in their adjustment of their artillery fire. They had set up an observation post in a knocked-out tank, setting up a BC-scope in an open hatch.

They began their adjustment. When the mortar rounds began to fall next to the tank, the fascists took down the BC-scope and stopped the adjustment.

But we continued to fire. And here was the joy: the fourteenth round fell directly in the open hatch and exploded in the tank. The enemy observation post was destroyed.

I well remember an incident which shows the resourcefulness of the Soviet men. The maximum angle of elevation of the 120-mm mortar is 80 degrees. In this case, the round falls at a distance of about 450 meters from the mortar. This is "dead space." However, in a combat situation, although rarely, there were cases where it was required to conduct fire at 200-300 meters. How did we get out of the situation?

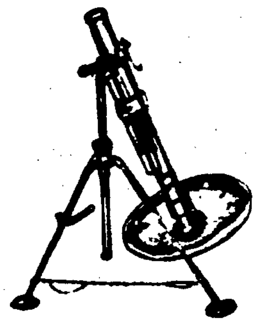
In the summer of 1943 the battery participated in battles on the Kursk Bulge. The firing position was in a deep gully. Suddenly, the observers noted that enemy submachinegunners are making their way toward us along an adjacent gully: the Hitlerites had decided to capture the mortars which had annoyed them or at least force them to fall silent. Having assembled in a gully about 200 meters from our position, they sent out reconnaissance and themselves began to prepare for an assault.

What was there to do? Bullets could not reach the fascists in the gully and, really, the mortar is unable to fire at such a short range. The battery commander ordered setting the mortar of Guards Sergeant S. Petukh at the maximum possible angle of elevation and opening fire. But they received an "over." Then the section set the tube almost vertical, higher than the maximum angle. And Guards Sergeant Petukh supported it so that it would not tip over. Now the mortar rounds flew accurately into the adjacent gully. We understood this immediately from the shouts which came from there. Fifteen rounds were fired like this. As a result, some of the fascists were killed and the remainder fled hastily.

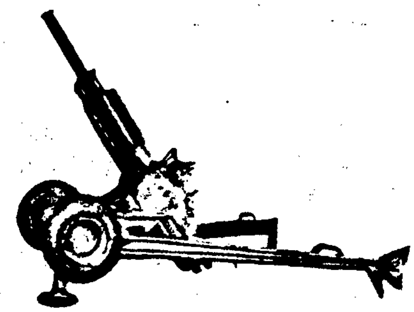
The Great Patriotic War showed convincingly the importance of using mortars. If initially they were employed only for close infantry support, subsequently they were brought together in units and large units capable of accomplishing independent missions.

The motherland evaluated highly the mortarmen's contribution to the victory over the enemy. In our Guards rifle regiment alone four sergeants and soldiers were decorated with Orders of Glory of all three degrees and many were awarded other combat orders and medals.

This weapon continued to be improved in the postwar period. In 1949 a new 160-mm mortar was accepted in the inventory. Some time later the most powerful in the world--the 240-mm mortar-- received its start in life. Mortars for automatic fire appeared. In short, the mortar remains a formidable weapon even today.



82-mm mortar Model 1941



Contemporary automatic mortar

6367
CSO: 8144/0891

UNDERWATER RESCUE TRAINING DISCUSSED

Moscow KRASNAYA ZVEZDA in Russian 17 Jan 84 p 2

/Capt 2nd Rank Yu. Timoshchuk, KRASNAYA ZVEZDA correspondent, Red Banner Northern Fleet: "Along in the Deep"/

/Text/ On the deck of the rescue ship, sprinkled with frozen snow, Capt-Lt of Engineers G. G. Getmanets was admonishing his subordinates for the last time. In the shadowy light of polar twilight the faces of the deep sea divers seemed alike. And actually all of those gathered in the thick of the cold sea were alike, with strict features and a hard look, especially attentive to the senior's directions. For they had learned for ever that each dive under water was completed, difficult work--even when it is only military training.

As an introduction, today the divers were faced with assisting a submarine "damaged" by "enemy" depth charges. Having taken on a lot of water in the "damaged" compartments, she had sunk to the bottom.

The depth was relatively shallow. It wasn't a record for the deep sea divers, but for a man under water even in relatively simple circumstances normal vital activities are difficult. Air in a diver's lungs is under great pressure and therefore part of the nitrogen in the lungs dissolves into the blood creating the threat of caisson's disease during the ascent. And although there are strict tables for a safe ascent, a pressure chamber and the great amount of experience accumulated by many generations of divers, there is still the possibility that the deptsh will claim a sacrifice. For a diver, even while working in an environment with comrades, in many ways he is alone in the deep.

Diving, therefore, is not a let's-take-a-stroll in the sea. In a combat situation, a diver must be ready to save people, bring up ammunition and sunken equipment, inspect and repair ship hulls and fittings, cut and weld metal, stop leaks, etc. As the experience of the last war shows, the enemy rarely allows ideal conditions for underwater work. The most dangerous situation is caused by close shell or bomb explosions.

And today, primarily to prepare for the sudden complication of rescue work, a "subject" was built for the divers' training descents. First to sink under water in the massive steel bell is deep sea diver 1st class Sr Sailor B. Kulyk. He began to survey the situation. The bell was to take up those rescued from the

"sunken" vessel. The commander had to decide how to organize the help for the crew of the sunken submarine based on information received from the senior sailor. But information had hardly begun to come up from the sailor when an "enemy" plane which had broken through dropped bombs in the nearby water. The hydrodynamic shock wave caused diver Kulyk to "lose" consciousness.

Dive expert Lt of Engineers V. Shcherabakov immediately ordered the safety diver Sr 1st Class Petty Officer I. Zvarych to quickly dive, find the "injured" diver and help him. Another pair of divers prepared to descend together with Zvarych.

On board the rescue ship they could only guess about the actions of the divers under water. But the dive expert in charge of training at times has to see with his own eyes how they are doing. I too wanted to take a look. Each new dive, like a new flight, a new cruise, is unusual and interesting in its own way. Going through all the necessary formalities and since I was licensed to dive, I got the "OK" to descend with the third group. A tight rubberized diving suit covered my shoulders and lead shoes held my feet to the deck. Senior sailors V. Tsilinko and V. Dudnik attached the load on me, fastened a diver's knife, attached the signal hose counter, and reported.

"Third man ready to dive."

Captain Lieutenant of Engineers Getmanets inspected and checked my diving gear. As is the custom, a slight tap on the shoulder let me know that I was cleared to dive.

Soon I found myself on the special metallic boatswain's chair, which makes a diver's descent and ascent easier while in the heavy shell. The portholes were hardly even with the rescue ship's waterline. On the other side of the viewing ports the stricken wave rolled. The body becomes aware of the silent power and the coolness of the sea's deep which was zealously squeezing the rest of the atmosphere from under the folds of the diving suit.

The deep is relentlessly pulling me into its own embrace. Despite the many kilograms of armor, the deep makes the body weightless, trying to push it back to the surface. In front of the viewing port, the phosphorescing "sea snow" from small flaky particles and plankton organisms sparkles and ripples. At the bottom is naked granite rock cleaned by tidal currents. The deep silence suddenly yields to the noise of waves and passing ships.

"I'm at the bottom and I feel good," I report on the panel in the boatswain's chair.

Over my head indistinguishable from below is the rescue ship. Ahead, providing horizontal visibility, the reflector of the depth bell is giving off light rays. I aim towards it. Through the whitish curtain I see the divers. In orange diving suits and intricate helmet masks they look like fantastic aliens from some other planet.

One of the sailors is lying motionless. The second, bent over, is priming the breathing mixture in his comrade's diving suit. Then he pushes off from the bottom and swims up to the doorway of the rescue bell. Divers and objects seem significantly enlarged and closer.

Senior Petty Officer 1st Class Zvarych, after turning the "sufferer" over on his back, pulls him to the doorway of the lower hatch on the diving bell hanging over us. Doctor-physiologist Capt of Medical Services A. Antropov gives Senior Petty Officer 1st Class Zvarych recommendations and advice.

I look at the divers weightlessly soaring around the cylindrical bathyscaphe and I remember a television report on our cosmonauts' walk in open space. The resemblance extends beyond the superficial. Similarities in difficulties are also present. The depths of the world's oceans and of the universe's space reluctantly reveal man their secrets.

Even modern equipment has not greatly increased man's ability to perform underwater. For example, after a 3-hour stay at 90 meters a diver needs no less than 20 hours for his ascent and decompression.

It is impossible at great depths to breathe a normal air mixture. At the pressure corresponding to 100 meters the air mixture is so dense that a man would use up all his strength for one breath. Therefore helium replaces the nitrogen. But this creates new problems.

Naturally problems still exist in the diving profession. And one must add to these the problems which can develop in a combat situation.

An indispensable quality, reliability must distinguish not only officer-instructors and experienced warrant officers, but also sailors who have just started their own diving log. Only through reliability can a diver count on a good relationship with the deep. Young communist Petty Officer 1st Class Zvarych has more than once been mentioned for bravery and skill in completing his crucial missions. As a foremost fighting man he was invited to join the VLKSM /All-Union Lenin Young Communist League/ Central Committee. Expert of military affairs, Warrant Officer S. Kolpakchi has considered a diving suit his work clothes for nearly 10 years already. He has completed countless missions. He has raised ships sunk during the war, wreckages of planes, repaired ships.... And what can one say about Capt-Lt G. Getmanets. He has spent several thousand hours in great depths.

I heard the command "The next pair of divers prepare to dive," when the tenders had hardly removed the massive brass helmet from the corselet. Training on providing assistance to each other during rescue operations was continuing.

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FOREIGN MILITARY AFFAIRS

CONTENTS OF ZARUBEZHNOYE VOYENNOYE OBOZRENIYE , No 11, NOVEMBER 1983

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 83 pp 1-2

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CSO: 1801/174

STATUS, PURPOSES OF U.S. ARMED FORCES OUTLINED

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 83 pp 5-11

[Article by Col E. Asaturov: "The Social Principles Underlying the Build-Up of the U.S. Armed Forces With Noncommissioned Officers and Lower Ranks"]

[Text] In 1983 it was 10 years since the U.S. armed forces were converted to the system of manning the forces exclusively with hired personnel. This was brought about by a number of factors (primarily the social and political effects of the failure of American aggression in Indochina), which produced a moral-political crisis in the U.S. armed forces. Despite the fact that this move neutralized to a significant degree the effect of the "Vietnam syndrome" on the personnel, the years since then have been an extremely difficult period for the Pentagon. The American magazine U.S. NEWS AND WORLD REPORT called it a "decade of demoralization." In order to bring the numerical strength of the armed forces, primarily the ground forces, up to established strength, they recruited not just those who were actually needed but also those who agreed to don the uniform for the dollars, the priviledges and benefits. The intellectual and general education level of the military personnel dropped as a result, and their social and racial makeup was substantially altered. It became a common thing for women to fill the vacancies in the U.S. armed forces.

In order to entice young people into the service, the American Defense Department went so far as to abandon certain traditional military procedures and principles, and for a long time it reconciled itself to the fact that life in the barracks was getting further and further away from the accustomed concept. Combat training and discipline deteriorated. The young soldiers looked with contempt upon noncommissioned officers with many years of service. The latter repaid them in kind. They were indignant at the leniency shown for drunks, brawlers and drug users. Career officers, disappointed in the service, attempted to leave the armed forces. They avoided encounters with their subordinates as never before. Councils of lower-ranking personnel, councils on race relations, councils of women personnel and many other pseudodemocratic bodies were created to reduce the growing tensions. The very fact that they were created reflected the severe conflicts in the hired army of the imperialist society in the 1970s.

As the newspaper ARMY TIMES wrote, "for too long the Department of the Army has stressed the meeting of recruitment quotas in order to demonstrate its ability to man the services without a draft. By doing so it ignored other important

requirements, and quantity was frequently considered more important than the quality of the recruits. This policy has had undesirable results, which have produced foment in all the ground forces, and this will continue to be felt in the future."

This picture began to change substantially at the beginning of the 1980s, however. The American command admits that not only is it not troubled by the quantitative aspect of manning the armed forces today but that it is actually permitting qualitative changes to be made and to return to that way of life and work for the forces which totally satisfied it up to the beginning of the 1970s. The newspaper ARMY TIMES notes that the ground forces now have around 10,000 men above authorized strength and the problem is one of ridding them of excess personnel and not the recruitment of new people. Levels set for hiring people with a secondary education have been exceeded; demands have been raised for testing mental abilities; and the influx of women into the armed forces has been limited. Increasing numbers of young Negroes are leaving the recruitment centers in disappointment.

An absolute majority of the American experts are of the opinion that the economic difficulties experienced by the nation, especially the growth of unemployment, have been the crucial factor in the changes. The U.S. Ground Forces Research Institute has calculated that a reduction of only 1 percent in unemployment would reduce the number of secondary school graduates hired for the ground forces by 8.3 percent, the Navy--6.8 percent and the Air Force--6.7 percent.

The influence of pay, which is especially attractive to the Americans, is being relegated to second place. The studies have shown that "both the unemployment level and pay constitute important factors for drawing secondary school graduates into the armed forces." The same calculations show that a 1 percent reduction in pay for military personnel would reduce the number of secondary school graduates entering the Navy by 1.4 percent and the number entering the ground forces by 2.1 percent. With this factor in mind the maximum amount of the enlistment bonus was increased at the beginning of 1982. Furthermore, the full amount is paid only to those recruited for the full term (4 years) in those combat military occupational specialties which relatively few people want to enter. First Sergeant Timothy Riley stated in an interview conducted by a correspondant of the magazine NEWSWEEK, many recruits whom he met at the training center in Fort Dixie [sic] had signed the contract mainly for the money, and he added: "What ever people do just for money cannot be a good thing."

Military advertising is the second important factor, sometimes of crucial importance, for young people deciding whether to enter the armed forces. The amount spent for this purpose has increased 60 percent in the past 2 years. A new slogan of the recruiters, "Be all that you can!", has been attractive to many people, especially in the situation of massive unemployment and a growing sense of hopelessness in the American youth. It advertises opportunities better than those existing in civilian life for acquiring an occupational skill, continuing their education under advantageous terms, and certain other privileges. In a survey conducted among American servicemen to determine what motivates young people to enter the armed forces, 64 percent of those surveyed were of the opinion that it is precisely this lure. They listed among their motives

the desire to acquire a specialty (35 percent), to obtain material possibilities for continuing their education (20 percent), and to establish themselves in life (9 percent). Only 10 percent stated that they "went for the sake of serving their country." So, only every tenth individual believed in the false premise that he would be defending the ideals of the "free world" against the "communist threat."

The marked increase in the number of American youth visiting recruitment centers made it possible to select the most "trustworthy," educated and physically healthy young people. New and heightened criteria were developed for the tests performed to reveal the applicant's "political maturity," educational level, aptitudes, and abilities and determining his suitability for the military occupational specialty selected. As a result of this, in the words of an official Pentagon spokesman, "many recruits who were formerly assigned to the higher levels of mental development should now be designated as level IV or V" (the lowest levels).

Even with the increased requirements, out of the total number of people recruited in 1982 (approximately 10 percent of the total number of lower grades and noncommissioned officers), 87 percent of the youth scored above the average (the figure was as high as 94 percent in the Air Force). These figures surpass those of the preceding year by 8 percent and are the highest since 1976. The number of individuals in the lower groups of mental development was cut in half, and it is anticipated that they will account for only 12-13 percent of the total number of recruits in 1983. A total of 88 percent of those accepted for the service have a secondary education (94 percent in the Air Force), which is 18 percent more than in 1980 (for the nation as a whole 25 percent of the young people lack a secondary education).

The new criteria of acceptance for the military service have had a substantial effect upon the racial makeup of the military personnel. According to the Brookings Institution, Negroes made up 12 percent of the lower grades and noncommissioned officers before the system of manning forces exclusively on the basis of hire, that is, approximately the same as for the nation as a whole. The U.S. Agency for the Study of Human Resources has calculated that between July 1973 and September of 1981 42 percent of the Negro youth between the ages of 18 and 23 years and suitable for the service were recruited into the armed forces. The figure approaches 50 percent when the officers are taken into account. During that same period only 14 percent of the whites and 15 percent of the Hispanics were recruited. The situation had already been altered substantially in 1981, however, by the more thoroughgoing selection process: The number of Negroes among those enlisted for the service had been reduced to 23 percent, while the number of whites had risen to 71 percent. By mid-1982 Negroes accounted for only 22 percent of all the lower grades and noncommissioned officers in the armed forces as a whole and 33 percent in the ground forces.

The heightened requirements greatly reduced the possibilities for Negroes already in the service to renew their contract. The report "Blacks in the Military Service" put out by the Brookings Institution shows that four out of ten young Negroes volunteering for the service since the draft was abolished have been in the bottom intelligence category. The reports also note that a large percentage of Negroes in the armed forces "could limit the effectiveness of the forces in

certain situations," could make them "not dependable for resolving internal and foreign problems when they have to deal with members of nonwhite nationalities."

Characteristically, this report acknowledges "a strikingly small percentage of Negroes among the officers and continuing racial discrimination in appointments, in advancement in the service and in the functioning of the military legal service." Negroes make up only 7.8 percent of the officers in the ground forces, 4.8 percent in the Air Force, 4 percent in the Marines, and only 2.7 percent in the Navy. Attempts have recently been made under various pretexts to rid the forces of Negroes. They account for almost 60 percent of those discharged from the ground forces without benefits, around 50 percent of those discharged for "undesirable conduct" and 45 to 48 percent of those sentenced to imprisonment.

Expanding the possibilities for recruiting men entailed a stiffening of the requirements for acceptance of women for military service. Since 1981 they have been required to have a secondary education.

The process of increasing the numbers of young people applying to the recruitment centers has been accompanied by an increase in the number of those who agreed to remain in the armed forces after serving out the effective terms of their first and subsequent contracts. Unemployment has also been the determining factor in this development. The American military press states that "after considering the extremely limited opportunities for finding jobs out of the army, enlisted men are renewing their contracts in record numbers." From 1981 to 1982, for example, the number of individuals renewing their contracts (out of the number judged suitable in all respects for continuing in the service) grew from 61 to 72 percent, and was 12.7 percent for female military personnel. This permitted the American command to shift the stress in the problem of manning the forces from the recruitment of new personnel to retaining individuals who had served out their contracts. In order to further stimulate this process larger raises were given to individuals in precisely this category when the regular pay raises were made, unlike the previous period, when priority was given to new personnel. A new program of education systems was also developed for them. The rank of sergeant was established for the renewal of contracts in each battalion.

Over all, steps taken to retain in the armed forces those who have served out their contracts made it possible to practically eliminate the shortage of sergeants and specialists which had existed for a number of years (they account for around 40 percent of the total number of noncommissioned officers and lower grades). The shortage of noncommissioned officers in the basic slots reached 7,000 in the ground forces in August of 1981, for example. It had been reduced to 2,150 by November of 1982, and it was planned to totally eliminate the shortage by March of 1983. The loss of noncommissioned officers from the most important occupational specialties from failure to renew contracts was reduced correspondingly from 34.5 to 12.7 percent. Among other things, it is planned to accelerate the conferring of NCO ranks in order to halt this process.

Increasing the incentive for a considerable number of the noncommissioned officers and lower grades to continue in the service has permitted command to introduce certain restrictions to achieve a more thoroughgoing selection process and exert

additional pressure upon those who have agreed to remain in the armed forces. They are differentiated in the following manner, according to the amount of time they have spent in the forces.

According to official Pentagon data, 73 percent of those individuals who had completed their first service term under contract (they make up more than 60 percent of the noncommissioned officers and lower grades) and were judged suitable expressed a willingness to renew their contracts (82 percent in the Navy, 79 percent in the Army, 75 percent in the Air Force and 57 percent in the Marines). The figure was 61 percent in 1981. The quota for contract renewal by those who had served out their first term of service was exceeded by 9 percent in the Army as a result. In 1983 only approximately half (31,400) of the 60,000 servicemen "worthy" and desiring to serve a second term in the Army will be kept in the service. The American experts believe that this will create the conditions for an even more thorough selection process. In 1982 47 percent of personnel renewing their contracts were in intelligence group IV, while this year it is planned to retain 20-25 percent of them (with 70 percent desiring to remain in the service) by implementing these measures, the American command is mainly eliminating the unsuitable individuals and primarily those who are politically unreliable, as well as those with lower intelligence scores (from among those recruited in 1979 and 1980).

In addition, under the regulations which went into effect on 1 January, 1982, reenlistment is not permitted for those who have not earned the rank of corporal (specialist fourth class) during their first 3 years of service or who have been AWOL briefly two or more times or have been AWOL once for a long period of time during the preceding 24 months. The more difficult qualification tests have deprived servicemen up to the rank of specialist fourth class inclusively, who have not achieved the required scores, of the opportunity to remain in the service for a second term.

A study conducted by the Rand Corporation, a research organization, has shown that for those who have served two terms under contract, "money and the possibility of receiving a new assignment are the most important factors considered for deciding whether to renew their contract." The typical NCO has been defined from the results of a survey of 2,500 servicemen: He is 27 years old, white, has 7 years of service, a secondary education and is married. These make up 12 percent of the total number of noncommissioned officers and personnel in the lower grades.

Data from the same survey shows that the noncommissioned officers and lower grades are extremely interested in having the right to select their duty station. With such a guarantee the number of servicemen renewing their contracts would increase by 59 percent in the Marines, 49 percent in the Navy, 39 percent in the Air Force, and 35 percent in the Army. It is calculated that the drawing force of such a guarantee is equivalent to increasing the pay by an average of one third. The survey showed that the same results could be achieved by enhancing opportunities for advancement in the service by a factor of 1.5.

Reducing the regular tour of duty by half (to 2 years), at the end of which many servicemen might decide to serve the 20 or more years required to receive a pension,

is named as one of the likely ways of enhancing interest in renewing contracts for individuals in this category. In the opinion of the experts who performed the study, the latter "has become a more important incentive than immediate monetary reward, selection of the duty station or the period of time covered by the renewed contract."

The existence of an adequate number of personnel desiring to remain in the armed forces after completing the term of service covered by their second contract has created the conditions for a more thorough selection process among this category of servicemen as well. As the Army's deputy chief of staff for personnel stated, "Perhaps we will now focus our attention on those soldiers who do not meet the quality standards required by the Army. We shall probably change our regulations so that only individuals with a secondary education remain in the Army."

The third category of noncommissioned officers and lower grades is made up of servicemen who have served a considerable period of time in the armed forces. The Pentagon's official statistics place in this category individuals who have served 12 or more years and are planning to serve until they are entitled to a pension (around 10 percent of the total number of noncommissioned officers and lower grades). In 1982, for example, the average candidate for the rank of sergeant first class was over 37 years old, had studied almost 13 years and had served in the armed forces more than 16 years, including 4 years in his previous rank. In view of this category's increased interest in earning a pension and for purposes of applying pressure to them, in 1982 the chairman of the Joint Chiefs of Staff granted authority to refuse to renew contracts and to discharge from the armed forces even those who have 18 years of service. Previously, this had required the permission of the secretary of the branch of armed forces.

Increasing requirements with respect to physical capabilities and weight has been an important means of increasing the stamina and physical condition of the personnel. Noncommissioned officers and lower grades who have not achieved the minimum number of points for running, push-ups and knee-bends in three tries at 4-month intervals may be discharged. Mandatory testing is performed before graduating from the schools of the branches of forces (or services), and diplomas are not issued to those who have not achieved the required scores. Overweight personnel are not permitted to enroll at NCO schools; they are not permitted to renew their contract and are requested to leave the service. In accordance with a directive issued by the U.S. assistant secretary of defense in October of 1982, it is permitted to transfer to the reserves individuals sidered unsuitable for active service for any reason, including political reasons.

The improvement in the quality of personnel and their interest in extending in the service have permitted the American command to intensify the combat training substantially. In the assessment of U.S. experts who have studied the state of combat training for the entire period "since Vietnam," it has now become "more intensive and realistic." The amount of flying time has been increased in the aviation (from eight to fifteen flights are made per month), as has the number of practical tank firing exercies. Basic training and advanced individual training for the soldiers was extended from 7 to 8 weeks (from 308 to 405 hours) in 1981, and the daily class schedule has been increased from 8 to 9.2 hours.

The American military press states that the new combat training program is designed to "accelerate the process of developing a reliable soldier..., to create the conditions for improving the hired soldier's discipline." The chiefs of the training centers were issued direct instructions long ago to give special attention to "training rigidity" and discipline.

In order to strengthen discipline in the armed forces the benefits previously extended for early discharge have been eliminated. The number of reasons for discharging personnel has been extended to include such grounds as "in the government interest," "inability," "false enlistment," "unsatisfactory performance of one's duties," "failure to be cured of drug addiction or alcoholism," "bad conduct," "for security reasons" and others, which make it possible for command to rid itself of any undesirable serviceman and to exert constant psychological pressure upon all those who look upon the service as advantageous for themselves.

New types of punishment for petty infractions were defined at the end of 1982, which can be imposed separately or in combination. They include restriction to the unit for a period of up to 14 days, up to 14 extra duty details and reprimands. Previous penalties for gross infractions have also been retained. These include restriction to the unit for up to 60 days, up to 45 extra details, reduction in rank by 1 grade, arrest and detention in the guardroom for a period of up to 30 days, the withholding of up to one half of the pay for a period of 2 months, and others. These penalties are imposed upon 150,000 servicemen each year. The disciplinary role of the junior commanders has been increased. They have been granted authority to petition an officer to impose or cancel punishment. A prohibationary period of 30 days has been set for eliminating malicious drunkenness and drug use, at the end of which a serviceman who has not passed the test may be discharged.

According to official Pentagon data, 1982 had the greatest drop in the number of recorded infractions of military discipline for the past 5-year period. The American experts attribute this mainly to the "improved qualitative makeup of the recruits and the unprecedented level of unemployment," while at the same time acknowledging that the Air Force has managed to reduce the incidence of desertions and AWOL cases by imposing harsher punishments and by discharging offenders." Nonetheless, according to the same data, 26,214 cases of desertion and 75,387 AWOL incidents were recorded that year. The best situation with respect to discipline exists in the Air Force and the Marines, while the Army is in third place.

In a search for ways to unite people who enter the military service primarily out of avaricious, egotistical interests and aspirations into a single collective, the American command worked out and began implementing a program called "Cohort" (which referred to a military unit in ancient Rome and is at the same time an acronym formed of the first letters in the English words "cohesion, readiness, and training"). It is designed to create subunits in which the personnel will serve out the entire period of time specified in the first contract.

Nineteen companies permanently based in the USA were created as an experiment. They will be sent to oversea bases by turns. Upon returning, the personnel who

have served out the period covered by their contracts will be discharged, the subunits will be disbanded and reformed by the same principle. The first such subunit left for Europe in October of 1982. The chief of staff of the U.S. Army states that it is planned to have as many as 80 companies and batteries in the "Cohort" program by mid-1985, and it is planned to extend the program to battalions this year.

The above measures are being supplemented by increasing ideological pressure on the servicemen, by instilling strong anti-Soviet convictions in them and developing in them a blind readiness to carry out any order, which is characteristic of mercenaries. The campaign to rehabilitate the butchers of the Vietnamese people--American enlisted men and officers who took part in the aggression against the Democratic Republic of Vietnam--has reached unprecedented scope. A monument honoring the punishers who died there has been opened in Washington. The military magazine ARMY has carried an article on the participants in the Vietnam adventure, eloquently entitling it: "They Too Were Heroes." The bloody deeds of that period are now openly presented as a standard of conduct for American servicemen, a model which must be emulated by those who have now entered the armed forces.

The recent increasing frequency of demonstrations of U.S. military might in various areas of the world involving large groups of military forces, the increased aggressiveness of Washington's foreign policy and its anti-Soviet, anti-socialist orientation reflect the growing confidence of the American military-political leadership in the preparedness of their armed forces to support implementation of the adventuristic, hegemonistic course.

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COMMAND AND CONTROL IN MODERN COMBAT

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[Article by Lt Col M. Zagorskiy: "The Principles of Command and Control in Modern Combat (According to the Views of American Experts)"; Passages enclosed in slantlines printed in bold face in source]

[Text] In their plans for preparing for new wars of aggression the leaders of the U.S. armed forces are giving special attention to one of the most important factors for achieving success in a battle (operation)--reliable and effective command and control. It is felt that even in peace time this should pervade all aspects of the functioning of the forces and have a positive, stimulating effect upon subordinate personnel. A statement made by American General (Amler) that "...the nation must put the entire system of control in order, so that it does not raise doubts in the soldier as to its effectiveness" is noteworthy in this respect.

Current U.S. Army regulations and manuals state that modern combat operations may be conducted continuously over a lengthy period of time, day and night. Control takes on special importance in the complex kinds and forms of battles (operations) which are a component of the new American "air-to-ground operation (engagement)" concept. In the opinion of the experts it consists mainly of coordinated combat operations by ground and air forces for the simultaneous destruction of the enemy to the entire depth of the operational order of the enemy's troops. All types of weapons, including nuclear and chemical weapons, are to be used for defeating the enemy. The basic principles of this concept are initiative, depth of impact on the enemy, flexibility and the synchronized employment of all forces and weapons in the process of achieving the common objective. The American command believes that these principles can only be realized with determined, precise and constant control. It is therefore not suprising that control is considered to be one of the most important components of the concept of combat strength for the ground forces, one which is of crucial importance with respect to all the other components (fire, maneuvering and so forth).

The term troop control /(command and control)/ as used in the U.S. Army means purposive action on the part of the commander to direct the men and women under his command for purposes of achieving the missions facing them. The skillful control of combat operations depends upon the personal qualities of the commanders and calls for their use of a combination of personal example and force.

The foreign military press states that the specific nature of the demands made of control at all levels, from the section to the field force, differs, but that all of the commanders are to be of strong character and at the same time understand their soldiers, have a good understanding of the means and methods of conducting warfare and perform with conviction and valor. The main function of the man in charge is to be able to effect the personnel to perform difficult missions in difficult situations. The commanders are also required to master the techniques for controlling the fire and the maneuvering, to make skillful use of the terrain, to understand the principles underlying the use of the air forces and interaction with Navy personnel and weapons, and skillfully combine the massing of fire and the concentration of the troops. Experience has shown that victory is gained by that commander who knows and skillfully employs the men and equipment at his disposal. The military experts state that all of this makes it possible to consider the commander to be the main and responsible person in the realization of the extensive potentials of the personnel, weapons and materiel and consequently, in the achievement of supremacy over the enemy.

At the same time the fact is stressed that a commander, who is granted sole authority to define the missions and to issue combat orders and instructions, may be unable to cope with his duties in the contemporary situation of ever increasing complexity in the supervision of the troops and the increased importance of the time factor, unless he focuses entirely on the resolution of the most important control questions and makes total use of the possibilities of his staff.

The staff was created to assist the commander, and the duties of all its personnel are identical in form. They consist in gathering and assessing information on the situation, predicting the course of combat operations, informing the commander on specific areas of the work, working out recommendations and draft orders and monitoring their fulfillment. The regulations stress the fact that staff officers cannot independently take on the commander's functions, with the exception of those cases in which he authorizes them to do so. However, it is permitted and even recommended that certain of the best trained staff officers be granted authority to independently work out plans and issue instructions in the commander's name.

In the opinion of American military experts the control process includes organizing the continuous collection and study of information of the situation, adopting the plan, informing subordinates of the missions and organizing interaction, preparing the troops for the battle (operation) and directing them.

In the performance of missions to ensure the continuous collection and careful study of information on the situation control is organized in such a way that the work of the staff and subordinate commanders effects the rapid, flexible, precise and synchronized employment of all intelligence personnel and equipment for determining in good time when the situation is right for gaining and firmly retaining the initiative. Only joint efforts by all types of intelligence agencies can reconstruct a realistic picture of the combat situation. It is believed that the most difficult problem is that of obtaining information on the enemy and the terrain. No matter what kind of efforts are made in this area, the commander will never have exhaustive and complete intelligence. It is therefore recommended that he assign the intelligence gathering bodies

realistic missions conforming to the capabilities of their personnel and equipment and that he indicate the sequence for their execution. The commander must not give in to the temptation to strive for intelligence information in greater detail than he actually needs, since this interferes with the timely analysis of important information.

Troop control in moderm combat is based on the commander's plan. The process of adopting the plan begins when the combat mission is received. With the help of his staff the commander assesses the situation, works out the battle plan and defines the missions for subordinate personnel and facilities. It is felt that the lower the military echelon, the more simple, specific and rapid should be this process.

It is recommended that the situation be assessed mentally, rapidly and in a specific sequence: clarification of the mission received and a study of available information on the enemy and the terrain on which the battle is to be fought, the weather situation, the condition and status of one's own forces and the availability of time to organize the battle.

American military experts stress the special importance of assessing the mission received, since the commander must understand what must be done to execute it, when and where.

The enemy is assessed for determining the combat cababilities of the enemy grouping and how it is likely to effect the execution of the mission. Judging from information published in the foreign press, it is recommended that the commander make extensive use also of the method whereby he mentally puts himself into the position of the commander of the enemy grouping, adopts a plan as the enemy commander and prepares it with his own.

Terrain conditions have a substantial effect with respect to the degree to which the combat capability can be realized. It is therefore believed that a correct assessment of the terrain makes it possible not only to make maximum use of the combat capabilities of one's own personnel, equipment and weapons, but also to reduce to a minimum losses inflicted by enemy weapons. Taking the features and the specific nature of the terrain into account, the commander must arrange for the maximum degree of shelter and camouflage for his troops, outline steps to prevent the enemy from taking advantage of protective natural features and force the enemy to operate on axes open to fire, and to destroy the unity and integrity of the enemy grouping's battle order; and take steps to mislead the enemy with respect to the real locations of his own troops and to increase the duration of the action taken by his own personnel and weapons against enemy targets.

With respect to the need to consider weather conditions, the American military experts note their significant influence upon visiblity on the battle field, the mobility and maneuverability of the troops and the employment of guns and aircraft. It is recommended that this be based not on the desired forecast but on an objective forecast, since complete and correct planning of the combat employment of personnel and weapons depends to a certain degree upon it.

One's own troops are assessed for purposes of precisely determining their status and combat capabilities. This information is ordinarily known to the commander and staff in only general terms, and it is therefore essential to precisely determine (calculate) the combat capabilities of the troops for a specific period of time and for the specific combat situation. It is equally important to assess the advantages and the deficiencies of the tactical situation of one's own troops relative to the enemy and to outline appropriate steps for utilizing and strengthening an advantageous situation and for maneuvering in the course of the combat operations.

The U.S. Army command is devoting ever increasing attention to the matter of considering troop morale. The experts believe that in the final analysis the successful outcome of a battle depends upon how thoroughly the soldiers understand their mission and how resolutely they perform, especially at the battalion-section (crew) level. It is felt that soldiers will enter a battle with the required confidence, determination and will to win when they know that the other servicemen on land and in the air will be fighting in the same manner. In general it is deemed essential by means of brainwashing to create and maintain in the forces a morale climate which would contribute to the successful performance of combat operations by all categories of personnel in the subunits and the units. When they assess their troops it is therefore forcefully recommended that the commanders take morale into account and that they be capable of convincing their subordinates that the assigned missions are absolutely achievable and that they must apply themselves completely for accomplishing the combat missions.

Time is extraordinarily important in modern combat operations and should be used expediently. American military literature notes that the senior commanders at any level are authorized to use for planning and working up the operations documents no more than one third all the time allocated for preparing the troops for combat operations. It is felt that this should contribute to the implementation of all the measures essential for organizing reconnaissance, planning the battle and preparing available personnel, weapons and equipment at all the subordinate levels.

Statements by military experts published in the American's press stressed the fact that the assessment of the situation is not the aim in itself. It is more like the background against which the commander defines possible variations of the concept and assigns priority to the most feasible of them. The concept of operations is a sort of adequately detailed model permitting the staff officers and subordinate commanders to understand precisely what they are to do immediately and how they are to pursue the battle in case further instructions are not forthcoming. At the minimum, it must therefore indicate the time and the position for switching to the attack (the contour of the forward defensive edge), the kind of maneuver to be executed and the method to be used, the battle order and methods of interaction. Precisely these principles underlie the planning of the battle, which is expected to ensure unity of the efforts of all personnel, weapons and equipment in the course of achieving the precisely defined, main mission (objective). Since the battle plan will ordinarily be executed under pressure, it must be simple. If the situation makes it necessary to have a complex plan, it is emphatically recommended that simple and effective steps be outlined for implementing it.

U.S. Army regulations demand that commanders at all levels, especially the lower levels, try to personally assign the missions to their subordinates. This considerably reduces the likelihood of incorrect interpretation of the orders. The American military press states that it is essenital to have a list of a permanent group of officers to be present when the commander explains his concept and the combat order.

It is recommended that this group ordinarily include the deputy commander, the chief of staff and "key" staff officers, as well as the necessary commanders from subordinate troops. It is felt that the existence of such a permanent group enhances the effectiveness of control and permits the fullest possible use of the advantages of the so-called parallel work method in a situation of limited time for organizing the battle, a method which makes it possible to promptly alert commanders and staffs at the lower levels to changes in the situation with systematic supplementary orders or instructions.

A preliminary order is issued by the commander immediately upon receiving the combat mission for purposes of orienting subordinate commanders and staffs with respect to the nature of impending combat operations and making it possible for them to purposively initiate and accomplish the preparation of the troops. It is issued orally and includes at least the following information: the type of impending combat, the time available for making ready for the battle, the place and time for issuing the combat order.

The operation order clarifies the commander's concept, contains the combat missions and also covers matters of interaction. It is written up on a standard form, which includes sections on the situation, the mission assigned by the senior commander, the missions of the troops and weapons, and measures for the control and the all-round support of combat operations.

The American military experts believe that the possibility of a drastic change in the situation is a characteristic feature of modern combat and consequently, also the need for significant adjustment of the initial plan of action. A partial order is therefore issued for purposes of refining or cancelling the operation order when the latter has partly or completely ceased to conform to the new situation. It should contain information of extreme importance not provided in the operation order.

Matters of interaction are worked out in detail and all of the measures involved in preparing the troops are completed during the period of time in which the battle is organized. Control is exercised by superior commanders and staffs for purposes of verifying the timeliness and quality with which their subordinates execute their orders.

After the corps and division commanders have specified the quantity of combat means required, organized their preparations and support for the troops in the combat operations, and decided on the matters of interaction and all-round support, direct control of the troops and weapons is turned over to the brigade and battalion commanders. It should be noted that the American periodicals devote special attention to matters of troop command and control at the lower command levels (up to the brigade inclusively). The regulations require that brigade and battalion commanders skillfully define methods of action for the

units and subunits during the battle, define the battle formations in good time, based on terrain conditions and the maneuvering of the enemy, and precisely direct the firing of the weapons.

In order to exercise proper control during combat operations the military experts believe that the commanders must keep a close eye on changes in the situation, be familiar with reports from subordinates based on the situation, and assess reconnaissance information and personal observations. During the battle the commander must be close enough to his subordinates to provide them with emotional support and specific control. The fact is stressed that in such cases the senior commander can assess changes in the situation influencing the balance of personnel, weapons and equipment more rapidly than a subordinate and consequently, issue the necessary instructions in good time. According to American military theory, which takes into account the brevity of modern combat operations, the battle instructions must be worked out and issued rapidly and that the instructions themselves can reflect only three extremely important elements: a precisely defined mission, limitations and measures with respect to essential interaction and reinforcement (support) personnel, weapons and equipment.

It is felt that since the commanders cannot foresee, plan for or issue instructions for each change in the situation, they should not interfere in all the actions of their subordinates. In other words, there is a decentralization of control, which permits subordinates to take advantage of the slightest opportunity to develop the success. At the same time it demands that commanders at all levels demonstrate total initiative, quick-wittedness, imagination and most importantly, willingness to take a risk.

The American military press stresses the fact that subordinates cannot be expected to perform with initiative if they are not authorized to take risks. There are two sides to aware risk in combat. One side is the possibility of suffering large losses of personnel and materiel allocated for the accomplishment of the combat mission, while the other is the danger of not fulfilling the mission itself. All commanders must therefore assess the degree of risk on the basis of an in-depth knowledge of the situation, considering the relationship between these two aspects of risk, and ultimately decide what risks should be taken.

According to the views held by the American military experts an effective control system must be created in order in ensure reliable troop control. Describing a battlefield in the year 2000, General Morreli says, for example: "In order to gain a victory in the complex situation of a future war, we must have not only more accurate weapons and improved technical reconnaissance and observation equipment but also a more effective control system." On the theoretical level a troop control system is taken to mean specially trained personnel, signal and other technical equipment, as well as the organization and establishment of control agencies, the procedure for their functioning and the processes involved in working out the plan. The structure of control bodies differs at all levels, but their main and sole purpose is always that of implementing the commander's will.

A control system consists of a number of jointly subordinated systems at various command levels, which are based at their own command posts and have a TOE

system of personnel and facilities. There has recently been a trend in the U.S. Army to switch to the comprehensive control system, which, despite the complexity, is becoming more and more extensively used and includes the following control subsystems: control of formations, units and subunits of ground forces; all types of reconnaissance; field artillery; interacting tactical aviation, air defense forces, radioelectronic warfare personnel and equipment; engineer support; and rear services support.

It is the opinion of command that the demands made of the command and control system have remained almost unchanged in form, but that the quantitative, especially temporary, demands have become more rigid (operational efficiency, continuity, stability and secrecy have been added to the basic requirements).

The need to enhance the operational efficiency of control in modern combat is primarily a result of the time factor. The elementary (single) control cycle is considered to be the main quantitative indicator of operational efficiency for a control system. This is taken to mean the time spent collecting and processing information and adopting a plan, as well as the delivery of the missions to subordinates. The American experts believe that the extensive employment of automated control systems is the most important way of shortening this cycle.*

If a system is capable of functioning in a complex, drastically changing situation with powerful enemy counteraction, it is considered to be stable and capable of providing continuous control. Ensuring the survivability and mobility of the control points is considered to be the most important means of preserving stability in a battle. Among other things, it is recommended that the locations of the control points engaged in intensive radio traffic be switched frequently if they are within range of the enemy's artillery fire (and the optimal plan is to move them several minutes after a regular round of radio communication). However, the American experts believe that it is presently impossible to meet this demand due to the cumbersomeness of the control points themselves. Because of this a number of steps are being taken to reduce the number of personnel and the quantity of vehicles. There are now 250 men instead of 600 at a division's main command post, for example, and the American experts feel that this has not reduced its effectiveness.

U.S. Army regulations note that the secrecy requirement for a control system is changing qualitatively in the contemporary situation. This is due to the large quantities of radioelectronic equipment used by the control bodies and to the increased reconnaissance capabilities of the likely enemy. It is felt that technical achievements in the area of electronic means of observing the field of battle and the automated processing, analysis and transmission of information make it possible for the commander to control personnel, weapons and equipment almost within the real time scope. The possibility of using line and visual communication and at the lower levels, voice communication and runners, is not ruled out. According to statements by certain writers, the

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*For more detailed infomration see: ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No. 1, 1980, pp 41-46, and No. 6, 1981, pp 8-15.--Editor.

capacity of a command and control system to function better and more rapidly than the enemy's control system is taken as the overall criterion of its effectiveness.

11499
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DEVELOPMENT OF FORTIFICATION STRUCTURES DISCUSSED

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 83 pp 33-37

[Article by Eng-Lt Col G. Alekseyev, candidate of military sciences: "Manufactured Fortification Structures"; Passages enclosed in slantlines printed in boldface in source]

[Text] The foreign press stresses the fact that the commands of the armed forces of the USA and other NATO nations consider the fortification of an area to be one of the main ways of enhancing the survivability of the troops.

In recent years the efforts of foreign military experts have focused on the improvement of manufactured fortification facilities. They include structures for conducting fire, observation and control and for protecting personnel and military equipment, as well as special (internal) equipment: filtration units, air-tight and protective valves, blast dampers, space heaters, air conditioners, electric power sources and other life support systems. The work being carried out in this area involves the development of traditional means and the creation of new types of shelters and structures, and development of the technology for erecting, outfitting and repairing them. A system of scientific and technological measures is being implemented in the armed forces of the NATO nations, including standardization and unification.

The traditional types of engineer equipment include /weapon emplacements and observation structures/, which make up the largest group of fortification structures and require the greatest amount of excavation work. Their survivability depends in great part on how well they are camouflaged. Based on experience in the aggressive war in Vietnam and other local conflicts, the Western military experts believe that their role will be increased substantially in a future war.

Statements are made in the American press about the need to reconsider views on the fortification of areas of combat operations. Steps taken abroad to perfect this equipment have made it possible to work out recommendations for their development and adoption in the forces. Various manufactured structures for outfitting weapons and observation installations have come into use along with armored cupolas and machine gun nests, for example. Structures permitting maximum use of materials at hand have been recommended and tested. Among other things, collapsible screen containers of galvanized steel wire, filled with

stones, are being used for erecting installations. The gabions produced in this manner are laid in several rows or tiers and attached with wire, which makes it possible to erect structures of various configurations. An adequately high degree of camouflage is achieved.

The foreign press has recently been raising questions about fortification equipment for the American "Rapid Deployment Force." It has reported on the improvement of various manufactered elements for setting up gun emplacements and observation points using sand bags (Figure 1) [figures not reproduced]. The forces are already receiving sets of such elements, which are standardized in the U.S. Army. One-man shelters for gunners or operators of "Tow" anti-tank missile systems have been developed and testing has been conducted. A flexible dacron cover (1.5-X1.8 meters, weighing 0.74 kilograms) secured with guy ropes is used for building it (Figure 2). The shelter makes it possible to cover the pit with a layer of earth up to 45 cm. thick. The Western press notes that tests have shown that the shelter can withstand a pressure of 0.9 kilograms per square cm. on the shock-wave front.

The American experts have recommended the use of a new material, PSP, for building gun emplacements. The material consists of perforated metal sheets with a cellular ceramic material beween them. A strong structure can be created with several of these components. It can also be covered with earth. Tests have shown that the new material provides highly effective protection against conventional weapons. Corrugated matal sheets stopped up to 70 percent of the fragments from bombs launched from 120 mm mortars and medium-caliber shells 1.5-6 meters from the point of explosion. The new material can stop up to 98 percent of the fragments.

The U.S. Army uses a light cover for the SKOP machine-gun pit, which basically consists of a polyester sheet 2.4X1.5 m. The kit includes eight 15.2X-10.1 cm aluminum anchors with a dark, chemically treated surface and four terylene ropes 3.9 m long. The kit weights 0.9 kilograms. It can be stacked and carried in a pack and can be set up in 10 minutes. The anchors with the ropes attached are driven into the ground 1 m from the wall of the pit. The polyester sheet is laid over the ropes and covered with a layer of earth 45 cm thick. The structure can withstand a pressure of around 2 kilograms per square centimeter from an air shock-wave. It takes two soldiers no more than 25-30 minutes to set up the shelter.

The foreign press has reported on work being performed in the NATO armies to improve /frame-and-fabric and sectional fortification structures/. The foreign experts believe that such equipment will not lose its importance in the future. They consider its main advantages to be the small dimensions and weight of the kits for ease of transportation, the ease with which they can be assembled and set up, the possibility of altering the configuration of the structures in accordance with their purpose, the fact that they can be used repeatedly and their suitability for industrial production and repair. The disadvantages include the significant amount of manual labor required for using them. The foreign experts calculate that the amount of manual labor involved in setting up the fortification structures exceeds several times over the amount of work required to dig pits with engineering machinery.

The British MEXE Mk2 (Figure 3) is the most commonly used frame-and-fabric shelter. The kit includes metal parts (18 stakes, 28 struts and four arches). It has a total weight of 261 kilograms, a high-strength elastic covering (9.14X1.5 m rolls, weighing 32.6 kilograms each), a special, lined interior fabric of jute fiber, reinforced with 0.56 mm wire and covered with polyvinyl chloride, and an air filtration plant with a fan, which is driven by a 12 volt battery. When the structure is set up the covering can withstand a weight of a 5 ton vehicle. The structure is designed to withstand a blast of around 2 kilograms per square cm.

The Mk2 shelter has been tested along with six others at one of the U.S. Army's proving grounds. It was judged better than the others with respect to the amount of time needed to set it up, weight and transportability, and has been adopted as the shelter for a battlion command post. Arch shelters consisting of 7 sheets of galvanized, corrugated metal attached with bolts continue to be used. One sheet weighs around 270 kilograms, and the entire kit weighs 1,950 kilograms. The completely assembled structure is 3.65 m long, 3.85 m wide and 2.45 m high. The structure is set up on a special platform in a pit. The front wall consists of a steel panel with a sealed door.

The Western military experts believe that the plant-produced, standardized reinformed concrete blocks have not lost their importance and can be extensively used in building engineer structures. It is being demanded that it be possible to transport these blocks by air in the future.

The foreign press notes that work is underway in the NATO nations to find new materials for manufacturing the components of fortification structures. For example, the USA has tested asphalt-coated and plastic panels for resistance to conventional weapons and means of mass destruction, as well as simple structural elements consisting of wire cages with a synthetic shell and covered with earth. Studies are presently underway in the use of foam plastics for manufacturing the structural elements. In addition, it is planned to test components made of corrugated aluminum and reinforced plastic.

The Western press recommends increasing the thickness of the earth covering, tamping it down and providing additional protection for the entrances to give the fortification structures greater protection against neutron weapons. When there is a shortage of dirt anti-radiation shields can be made of hydrogenous plastic in combination with high-density materials. In shelters designated as control points, it is also planned to protect the inside equipment against electromagnetic emissions (EMI) from a nuclear blast by building electromagnetic shields and by enhancing the shielding properties of reinforced concrete and metal structures. These foreign experts have recommended a new shelter design for increasing the strength of structures made of metal components. It consists of cylindrical blocks assembled in sequence with rectangular interstitial elements, which receive the force from the shifting of the earth caused by a nuclear blast. This effect is achieved by means of special interlays, which transmit the force of the shift to ring-shaped projections protecting the bolts against pressure produced by the shifting.

The foreign press describes a large number of different layouts and structural designs for /transportable modular shelters/. They are assembled with individual

modules and can be used for building structures with various configurations and with various purposes. These shelters can be set up in pits (Figure 4), and some of the models therefore have ring bolts or hand jacks and outriggers.

The foreign press reports on an extensive program for the development of mobile command posts, which will make it possible to improve the survivability of the command and control system in a war. In the USA such a shelter is also being tested for resistance to nuclear and conventional weapons. It provides protection from bullets and fragments and can withstand shock-wave forces of 0.5 kilograms per square cm and the force of radiant energy from a nuclear blast in the air. The shelter is hauled on a standard Army 2.5 ton truck. It is made of (kevlar) and can be set up in the open or in a pit prepared in advance. In the former case it is attached to anchors with guidewires to prevent it from tipping over (Figure 5). The shelter is 3.7X2.1X2.2 meters. It is protected from the electromagmetic emissions of a nuclear blast by a shield of aluminum foil. During testing thermal radiation was simulated with a special tube in which aluminum particles were ignited. The blast wave was created by exploding 270 kilograms of trotyl at a distance of 365 meters.

In the mid-1970s the U.S. Army worked out the tactical and technical specifications for standard modular shelters. In accordance with these specifications a family of such shelters will consist of a 2.43X2.43X6 meter module with four different modifications differing in the design of their connecting assemblies (development was begun in 1977). The arrangement of the structure is altered to conform to its purpose (command post, communications center, hospital, depot). The components will be made in a set with a fully-equiped life support system and provided with sensors for monitoring the environment. One component can be set up by a crew of four in 30 minutes. The shelter is a double-layer structure of synthetic materials with aluminum honeycomb between the layers, which, along with giving strength to the wall, also serve as a shield against electromagnetic emissions from a nuclear blast.

The foreign developers are presently performing studies for the creation of new materials for modular shelters. For example, France is working on a material of aluminum and fiber glass with a heat-insulating lining between them.

Great Britian has developed the "Honeycomb Bombcell" shelter (Figure 6), which has a total weight of 2.5 tons and is broken down into nine components for transporting it. It provides protection against a blast wave of 1 kilogram per square cm. Penetrating radiation is reduced by a factor of 2000 when the shelter is covered with a layer of soil 1.5 m thick. The structure holds 18 cubic meters of clean air, which is adequate for the vital functioning of six people. It was subsequently decided to reduce the number to four or five. Air is supplied by means of a pedaled filtration unit, which can totally replace the air in the structure in 15 minutes (there is enough air for 6 hours of normal work). The shelter has a special device in the form of a tube with a light conductor, through which daylight enters the shelter and is distributed among the work stations. A 12 volt storage battery is ordinarily used as the source of electric power, but reports indicate that a diesel generator can also be installed in the shelter. The protective door is 1 m from the earth's surface. A jack is being developed for the door, because the tests showed a tendency for the door to become jammed by the force of a blast. There is a supply of drinking water (1,600 liters) and recycling equipment. It is planned to use a television camera for outside observation.

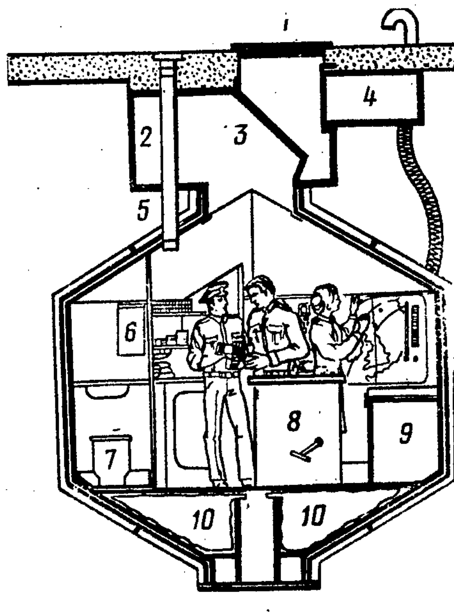

Figure 6. The British "Honeycomb Bombcell" Shelter
Key:

1. Protective hatch
2. Storage battery
3. Protective door
4. Air filters
5. Light conductor
6. Food supply
7. Lavatory
8. Pedaled ventilation unit
9. Container
10. Water tanks

The foreign experts consider the designing of /mobile units for creating the components of fortification structures/ in the field to be a promising area of work. Such a unit was developed in the FRG at the beginning of the 1980s, which can be used for erecting personnel shelters, communication centers and medical aid posts. The shelters are in the shape of semispheres and are made of reinforced isoprene. A kit includes a compressor, a foam-producing device, containers for the foam components, a rotation table on which the foam is set up, an electric generator and a compressor. It is hauled on a standard army truck and permits 30 structures to be produced with a single stock of components. When the system is set up the form is mounted on the rotating table and the foam is delivered through a tube attached to an arc-shaped girder. The foam is produced for around 60 minutes, after which the finished item is removed from the form and the process is repeated. The diameter of the structure is 5 meters at the base; it is 3 meters high; and the covering is 10 centimeters thick. A completed shelter weighs no more than 200 kilograms.

The foreign press reports that the armies of the NATO nations are making extensive use of inflatable shelters for personnel and equipment. Their main advantages are their simple design, light weight (1 square meter of the shell weighs 0.2-1.2 kilograms), the speed at which they can be set up and disassembled, and their transportability. In the USA it is planned to outfit the "Rapid Deployment Force" with these structures. The foreign experts believe that they provide protection against chemical and bacteriological weapons and radioactive fallout.

A new inflatable structure with rectangular sectional sides of strong materials is under development. Only the roof and the floor are stretched when the air props are created. The foreign experts believe that this design will make it possible to install the shelter in a pit and to cover it with earth, which will significantly enhance its resistance to the destructive elements of nuclear weapons.

The foreign press reports that the NATO nations are perfecting the technology before erecting fortification structures, with the attention mainly focusing on the excavation. Sets of pneumatic and electric hand tools, explosive devices for removing earth and mounted equipment for the engineer vehicles are being developed for this purpose. It is planned to use all of this equipment as a set, with the hand tools or the equipment mounted on vehicles being used for digging the boreholes for the charges of conventional or slurry explosives, the hole will be blasted out and the pit will then be finished with the engineer machines or by hand.

In the opinion of the foreign experts, the employment of the entire set of manufactured means in combination with materials at hand and natural factors will make it possible to a certain degree to assure the survival of troops in a nuclear war.

11499
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DEVELOPMENT OF ANTI-TANK WEAPONS IN SWEDEN

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 83 pp 37-39

[Article by Eng-Col O. Surov: "The Development of Anti-Tank Means in Sweden"; Passages enclosed in slantlines printed in boldface in source]

[Text] In the second half of the 1970s, according to reports in the foreign press, a number of Swedist companies began developing new models of weapons and ammunition designed for destroying armored vehicles, primarily tanks.

/The RBS-56 "Bill" light anti-tank system/ (Figure 1 [figures not reproduced]), under development by the Bofors company since 1979 under an assignment from the command of Sweden's ground forces, has a semi-automatic control system with infrared tracking equipment and command transmission by wire. The launcher for the PTRK [anti-tank missile system] is produced in portable (with a crew of two or three men) and self-propelled models. The first series-produced units should be received by the forces in 1986. They will replace the obsolete "Bantam" anti-tank missile system.

The missile, which is equipped with an influence detonator, has a warhead of basically new design, in which the hollow charge is positioned at an angle of 30 degrees to the longitudinal axis of the PTUR [anti-tank guided missile] (pointed downward). In the opinion of the Swedist experts, this makes the warhead more effective against inclined armored targets and makes it possible to destroy a tank from above (while flying over the target). The launcher for the system weighs 11 kilograms and includes a tripod mount, a sight with eight-fold magnification and control equipment. A heat-seeking sight is also being developed which will be installed above the daylight sight. The missile is launched from a transportable launching container by means of a gas generator. It is then accelerated by the sustainer engine and flys 1 meter above the line of sight.

The basic characteristics of the RBS-56 "Bill" anti-tank missile system are the following: total weight, 27 kilograms; weight of missile and container 16 kilograms; maximum flight speed for the anti-tank guided missile, 200 meters per second; maximum firing range, 2,000 meters; minimum firing range, 150 meters; armor-piercing capability, armor around 800 millimeters thick.

The /AT-4 84 mm hand-held anti-tank rocket launcher/ (Figure 2) is a short-range anti-tank weapon which is fired only one time. It includes a barrel

made of reinforced fiberglass plastic, a firing and trigger mechanism, a folding mechanical sighting device, a shoulder rest, a carrying strap and a hollow-charge rocket with a stabilizer which emerges in flight.

The rocket launcher's basic characteristics are the following: length, 1 meter; weight, 6 kilograms; weight of rocket with bursting charge, 3 kilograms; initial rocket speed 290 meters per second; maximum effective firing range against tanks, 300 meters (probability of striking the target with first shot, 0.5); armor-piercing capacity, armor 300-400 meters thick; time required to prepare to open fire, 4-5 seconds.

The total cost of developing the rocket launcher is estimated at 20 million Swedish kronas. The company has already manufactured 100 pre-series units of this hand-operated anti-tank rocket launcher and around 200 of the hollow-charge rockets for plant and troop trials. The foreign press reports that in demonstration firing tests the rocket pierced single-layer, homogeneous armor up to 400 mm thick. It is also reported to have extensive effect after it has penetrated the armor.

Troop trials of the rocket launcher, which began in the summer of 1982, will continue 18 months. The beginning of series production is set for 1984. According to foreign press reports the AT-4 will be the personnel anti-tank weapon of each Swedish infantryman. It will replace the 74 mm "Miniman" hand-operated anti-tank missile launcher in the ground forces. Orders for the rocket launcher are also expected from certain nations of Western Europe, Asia and Africa.

The /("Striks") 120 mm controlled mine/ is being developed by the state company FFV in cooperation with SAAB Scandia. It is designed for destroying armored combat vehicles, self-propelled weapons, volley-fire rocket systems and other targets.

The mine will have a cylindrical body, an infrared homing head, electronic control equipment, a hollow charge, a tailfin which emerges in flight, and small jet engines arranged around the body and designed for adjusting the flight path in the homing phase. This mine will be fired from organic 120 mm mortars by the conventional procedure but without ranging. It is guided to a precise target only in the final flight phase--that is, after the infrared homing head has locked on to heat emissions from the armored vehicle.

According to foreign press reports the SAAB Scandia company is developing an improved method for evaluating signals (infrared emissions), which will make it possible to eliminate the possibility that the mine will be guided to a destroyed target (a burning tank, for example). It is noted that with the high trajectory, the ("Striks") mine will be able to destroy an armored vehicle from the top, the most vulnerable side.

The mine's basic design data are the following: weight, 15 kilograms; length 750 mm; maximum firing range, 8.5 kilometers,(minimum range, 0.6 kilometers); flight time at maximum range, 50-60 seconds. It was planned to complete preliminary tests for developing the controlled mine in 1982 and to begin its full-scale development this year. According to the developers, it is planned to begin series-production of the ("Striks") mine in 1989-1990.

The /P 155 mm and 203.2 mm armor-piercing artillery shells/ under joint development by the FFV company of Sweden and Rheinmetall of the FRG are designed for destroying armored combat vehicles with prepared heavy fragments.

The P shell (Figure 3) consists of a cylindrical body, a screw-on ogival section, two fragmentation elements arranged one behind the other, and three burster charges. Each fragmentation element has a metal shell, in the forward part of which prepared fragments are compressed (170 in the 155 mm charge and 110 in the 203.2 mm charge), a bursting charge and a fuse.

According to foreign press reports the P shell functions in the following manner. An influence fuse is activated upon approaching the target (at an altitude of around 50 meters), as a result of which the forward burster charge is ignited. The powder gas produced in the process shears the thread of the screw-on ogival section, which separates from the shell. Two other burster charges are then activated in sequence, and the fragmentation elements are ejected from the shell body, which take on additional speed of 300 meters per second. At a height of around 15 meters above the target the elements explode and the prepared fragments, spreading in a 35 degree conical pattern at a speed of 1,450-1,600 meters per second, destroy the armored target from above. It is reported that fragments from the 155 mm shell penetrate armor up to 20 mm thick, those from the 203.2 mm shell--40 mm.

The /FFV597 135 mm super-caliber hollow-charge grenade/ (Figure 4) for the M2 "Karl Gustav" 84 mm anti-tank rocket launcher is designed for destroying tanks planned for the 1990s, which will have a powerful, multi-layer armor. Experimental models are presently being tested, and it is planned to begin production in 1985.

The grenade weights around 8 kilograms; it has a maximum effective firing range of more than 200 meters against tanks; and it can pierce armor 800-900 mm thick. A six-vane stabilizer opens up after it is launched.

The /FFV502 hollow charge, fragmentation grenade for the above-mentioned anti-tank grenade launcher is used for destroying personnel and lightly armored targets. It consists of a metal case, a propellent charge and grenades with impact fuses. The latter can be set for instantaneous or delayed action. A round weighs 2.2 kilograms; the grenade's initial speed is 240 meters per second; its maximum firing range against personnel is 1,000 meters; it has an effective range of up to 250 meters against tanks and can pierce armor 200 mm thick. It is planned to begin production of the FFV502 shell during the first part of 1984.

In the opinion of the Swedist command, the adoption by the forces of the above-described weapons will make it possible to substantially increase the capabilities of the ground forces for combating tanks.

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DEFENSIVE AIR OPERATION IN A THEATER OF MILITARY OPERATIONS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 83 pp 41-45

[Article by Lt Col V. Lakhvin: "The Defensive Air Operation in a Theater of Military Operations (Based on the Views of NATO military Experts)"]

[Text] In accordance with the unified statutes on operations of the tactical aviation and air defense personnel and facilities, which were approved in 1976, air operations are the main form of combat action for the air forces of the aggressive imperialist NATO bloc. The so-called defensive air battle is one of the most important of these.

According to the views of NATO military experts a defensive air operation is conducted in a situation in which the enemy has forestalled a strike or has temporarily gained the initiative. Its main objective is to protect groupings of forces, as well military installations, administrative and industrial centers, against air attacks, primarily nuclear weapons, to frustrate the enemy's plans for gaining air supremacy and to create the conditions essential for successful operations by the air and ground forces in the accomplishment of the missions assigned to them. The scale of an operation is determined by the scope and the nature of the enemy's operations, and it can last from 1 to several days.

As an example, let us consider the procedure for conducting such an operation in the Central European Theater of Military Operations (TsYe TVD), based on information published in the foreign military press.

In this theater of military operations it is assumed that the defensive air operation will be conducted by forces of the Central Zone of NATO's Joint Air Defense System in Europe interacting with tactical aircraft of the 2nd and 4th OTAK[Joint Tactical Air Commands], the 32nd Air Defense Command of the U.S. Army in Europe, the command element of NATO's long-range spotting and control aviation (AWACS) and air defense personnel and facilities of units and formations of the ground forces of the Northern and Central Army Groups. Some NATO military experts assume that personnel and facilities of NATO's Atlantic Air Defense Zone. and France's National Air Defense System may participate in such an operation.

The Western press estimates that a defensive air operation in the Central European Theater of Military Operations may involve up to 260 air defense fighters, more than 1,350 anti-aircraft guided missile launchers (including almost 450

Nike Hercules, more than 500 Improved Hawks, as many as 400 Roland, Chaparral and Rapira launchers [Figure 1 (figures not reproduced)], approximately 700 Gepard and Vulcan self-propelled anti-aircraft launchers, and more than 800 portable anti-aircraft missile systems of various types. The distribution of active air defense facilities with respect to nationality and air defense areas is shown in the table.

Distribution of Active Air Defense Personnel and Facilities in the Central European Theater of Military Operations by Nationality and District

Nation	Type of weapons	Air defense districts		Total in theater of military operations
		2nd OTAK	4th OTAK	
USA	Fighters[1]			
	F-15C	18	--	18
	F-15A	--	72	72
	F-4E	--	12	12
	Anti-aircraft missile systems[2]			
	Nike Hercules	--	144	144
	Improved Hawk	--	216	216
	Chaparral	--	182	182
	portable	--	350	350
	Vulcan anti-aircraft missile launchers	--	182	182
FRG	F-4F	30	30	60
	Anti-aircraft missile systems			
	Nike Hercules	144	72	216
	Improved Hawk	96	72	168
	Roland	36	72	108
	portable	144	216	360
	Gepard anti-aircraft missile launchers	144	216	360
Belgium	F-16A fighters	36	--	36
	Anti-aircraft missile systems			
	Nike Hercules	72	--	72
	Improved Hawk	60	--	60
	Gepard anti-aircraft missile launchers	55	--	55
Great Britain	Phantom-FGR.2	24	--	24
	Anti-aircraft missile systems			
	Rapira	104	--	104
	portable	96	--	96
Netherlands	F-16A fighters	36	--	36
	Anti-aircraft missile systems			
	Nike Hercules	16	--	16
	Improved Hawk	66	--	66
	Gepard	95	--	95

1. Only fighter-interceptors included in this table.
2. Number of launchers given in this table.

It is planned to use fighters from "dual-based" units and subunits of the U.S. Air Force, primarily 72 F-15A fighters from the 49th Tactical Fighter Wing. According to reports in the foreign press, they will be transferred for brief periods from the continental USA to Europe and may take part in the operation. In addition, the command element of NATO's Joint Armed Forces believe that part of the multi-purpose tactical fighters of the 2nd and 4th Joint Tactical Air Commands will also perform missions to repel enemy air attacks.

The commander in chief of NATO's Joint Armed Forces is charged with general direction of the operation in the theater, while direct supervision is assigned to the commander of the joint air forces in the Central European Theater of Military Operations (who is also commander of the Central Air Defense Zone, which is broken down into two air defense districts--the 2nd and 4th Joint Tactical Air Commands).

The Western experts calculate that during an operation in the theater combat aircraft on both sides may make as many as 10,000 sorties in a 24-hour period. Active use will be made of radioelectronic warfare facilities in all the phases, and it is therefore considered essential to organize control and interaction at all levels.

A network of control bodies has been created in the theater to direct air defense personnel and facilities. It is made up mainly of operations centers for the air defense districts and sectors, control and warning centers, control and warning posts.

The radar detection and warning system in the Central European Theater of Military Operations includes a large number of radar stations with various functions. Special attention is given to the detection of low-flying targets. This mission is performed by the West German Lars system, which includes 48 radar posts outfitted with mobile radar stations (it can detect targets flying at 3,000 meters at distances of up to 45 kilometers). In peacetime 24 radar posts are deployed in the first echelon, and it is planned to deploy the remaining 24 in the second echelon in time of danger, in order to increase the depth of radar coverage.

The AWACS long-range air spotting and control system has also been used recently for directing air force and air defense personnel and facilities. It is planned to assign the aircraft in this system (the E-3A) the missions of providing radar support for the combat operations of active air defense facilities and when necessary, the mission of controlling them. The foreign military press states that during the operation E-3A aircraft will be in patrol zones a distance of 150-250 kilometers from the front line, with direct cover provided by F-15 fighter groups.

In accordance with the statutes adopted in NATO it is planned to direct the personnel and facilities during an operation mainly in a centralized manner. The plans also cover the possibility of converting it to a decentralized system, however, if the overall control system is disrupted by a breakdown of communication channels, individual centers or posts. According to the foreign press the deliberate conversion of separate units and subunits to decentralized control is

permitted for repelling a massive attack by enemy aircraft on certain axes, especially in a situation of limited possibilities for the corresponding ground agencies.

The concept for such an operation ordinarily calls for the prompt detection of the air enemy by ground radar posts and AWACS aircraft, notifying command and repelling the attack with the patrol forces, while simultaneously putting the remaining forces in the highest combat readiness status. The axis of the main enemy attack, the enemy's intentions and the effective combat strength of the air forces involved are determined by analyzing the available information. The air enemy will then be destroyed with coordinated operations by all air defense personnel and facilities together with other branches of armed forces. In the views of the NATO command, conditions conducive to an offensive air operation would be created as a result of this operation.

In the opinion of the NATO military experts the main axes on which efforts to repel air attacks will have to be focused are the northern axis (personnel and facilities of the 2nd Joint Tactical Air Command and the Northern Army Group will be involved) and the central axis (the 4th Joint Tactical Air Command and the Central Army Group).

The NATO military experts believe that a defensive air battle in the Central European Theater of Military Operations will take place in two phases. In the first phase (which will last 3-12 hours) it is planned to use air defense alert personnel and facilities for repelling air attacks, with a constant build-up of the effort achieved by putting the other units and subunits into a state of readiness for combat operations. In addition, it is planned for the operation also to involve a strike by alert forces of the tactical aviation and with ground-to-ground missiles against airfields, control elements and other enemy facilities.

In the second phase (lasting from 1 to several days) the main air defense forces will be committed to the engagement. Interacting with part of the tactical air forces, they will combat enemy aircraft, focusing their main efforts on the main axes. Simultaneous steps will be taken to restore elements of the air defense system which have been put out of action.

It is planned to organized interaction between NATO's air defense system in the theater of military operations and the military air defense personnel and facilities at assigned lines and altitudes in such an operation.

The air defense system of the ground forces in the Northern and Central Army Groups (up to 150 kilometers in depth) constitutes the operational air defense echelon in the Central European Theater of Military Operations. Its weapons (anti-aircraft missile systems and self-propelled anti-aircraft artillery pieces) are limited in range and altitude and ordinarily lack radioelectronic systems for identifying air targets. In the opinion of the Western experts the range of visibility and visual identification of the enemy's combat aircraft is no more than 3.5-5 kilometers, and the use of infrared equipment increases this range to only 5-10 kilometers. It is therefore planned to effect interaction between the

fighter aviation and the active air defense facilities of the ground forces on the basis of zones of responsibility, which are distributed by area and altitude. Specifically, fighters in the front zone will conduct combat operations at altitudes above 3,000 meters.

Two anti-aircraft missile lines of the Central Zone of NATO's Joint Air Defense System in Europe constitute the second operational air defense echelon in the theater. The first of these consists of Improved Hawk anti-aircraft missile systems deployed 30-100 kilometers from the eastern borders of the FRG.

A grouping of Nike Hercules anti-aircraft missile systems deployed 80-300 kilometers from the eastern borders of the FRG form the second anti-aircraft missile line and are an important element of the air defense system in the theater of military operations. Since these missiles employ maneuverable flight paths, they are considered together with the fighter aviation to be the main means of focusing efforts on the main axes.

In a defensive air operation it is planned for the air defense fighters to be used beyond the range of the above-mentioned Nike Hercules and Improved Hawk anti-aircraft missiles.

According to reports in the foreign press interaction between anti-aircraft missile units and subunits, and fighters may be organized in a single zone on certain axes. In the opinion of many Western experts, however, this interaction is extremely limited by the tactical and technical characteristics of the anti-aircraft missile systems. They believe that it will be possible to significantly improve the conditions for organizing such interaction by adopting a new generation of systems (particularly the American Patriot).

In the use of fighter aircraft over areas of combat operations preference in NATO is given to aircraft armed with short-range "air-to-air" guided missiles with infrared homing heads (the Sidewinder, for example) and aircraft cannons. This is based on the fact that the existence of a large number of aircraft and the use of airborne radar jamming equipment in the zone of operations may prevent the certain identification of air targets and greatly limit the use of "air-to-air" missiles with radar guidance systems.

Combat employment of medium- and long-range "air-to'air" missiles by the fighter aviation is to be executed over enemy territory or for covering their own facilities in the depth of the theater. The NATO command believes that it is expedient to use F-15 fighters (Figure 2) for these purposes and to use the lighter F-16 fighters (Figure 3) in air battles over the area of combat operations of the ground forces.

The NATO military experts extimate that losses of enemy aircraft during a defensive air battle could amount to 7-34 percent of the total number of participating aircraft. They attribute this large range of possible losses to varying conditions for the beginning and the conduct of the operation. some of them believe that the dependence upon the conditions of the combat operations can be reduced and air defense as a whole can be made more effective, particularly in the Central European Theater of Military Operations, by completing the deployment of

the AWACS system in Europe, replacing obsolete missile systems with the new Patriot anti-aircraft missile system, resolving the problem of enhancing the effectiveness of the identification "friend-or-foe" system, increasing the number of all-weather fighters and improving immediate air defense for facilities by using modern short-range anti-aircraft missile systems.

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CSO: 1801/174

BUNDESWEHR AIR FORCE PERSONNEL TRAINING ABROAD

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 83 pp 45-47

[Article by Lt Col M. Sergeyev: "The Training of Personnel of the Bundeswehr's Air Forces Abroad"]

[Text] According to foreign press reports personnel of the Bundeswehr Air Force receive training, retraining and advanced training both in the FRG and in other nations belonging to the aggressive imperialist NATO bloc. The West German military experts attribute this primarily to the absence in the FRG of an adequate number of ranges and the great density of development and settlement of the territory, which limits possibilities for the air force to practice at low altitudes, as well as to the great density of flights by both military and civilian aircraft in the nation's air space. The flight crews and ground specialists of the FRG air forces are therefore trained in the USA, Great Britain, Italy, Portugual and Canada under inter-governmental agreements.

Personnel of the West German military aviation are trained at 35 sites in the USA. A special training command was created for the FRG air forces in 1966 to direct and monitor the functioning of all the training centers, ranges, workshops and other facilities placed at the disposal of the Bundeswehr air forces. It is headed by a commander with the rank of brigade general.

There are three main types of training for the personnel: flight, tactical, (mainly the combat employment of various models of aviation equipment and weapon systems), engineering and technical. The largest amount of attention is devoted to the training of specialists for subunits for the "Nike-Hercules" and "Improved Hawk" antiaircraft missile systems (including their servicing and repair), as well as the "Pershing" operational-tactical missiles.

The areas of training for personnel of the FRG air forces in the USA include the following: the aviation equipment and weapons, communications, aviation medicine, materiel support, geophysics, flight and safety problems, radar, radioelectronic warfare equipment and its employment.

According to the foreign press, the largest training center for the Bundeswehr air forces in the USA is the missile school at Fort Bliss, Texas. The school has a permanent staff of 300 and graduates around 1,800 airmen annually.

One of the main flight training centers for West German crews functions at Luke Air Base in the state of Arizona, USA. Pilots of the F-84F Thunderstreak (up to 1965) and F-104G Starfighter (the program was completed in March of 1983) tactical fighters began to be trained there in 1957. During that period 830 pilots were trained at the center for the F-84F aircraft and 1,868 for the F-104G. Average flight time was more than 90 hours for pilots of the F-84F fighters and around 145 hours for pilots of the F-104G.

The Second Air Training Squadron of the Bundeswehr air forces was formed at Luke Air Base to ensure fulfillment of the program for training pilots for the F-104G. It had 88 trainers (Figure 1 [figures not reproduced]) and combat aircraft at its disposal. Substantial assistance with the program's realization was provided by the U.S. Air Force command (organization, planning and accomplishment of theoretical and flight training) and Lockheed, an American aircraft engineering company (technical servicing and repair of the aircraft).

Judging from reports in the foreign press this center was closed in 1983, and the training of pilots for the air forces of nations in the NATO bloc, including the FRG, is accomplished at a special combined center recently set up in the USA.

According to the West German press a total of around 37,000 servicement of the FRG air forces had been trained in the USA up to 1983.

Crews of the West German military aviation undergo retraining for the new "Tornado" multipurpose tactical fighters, together with British and Italian airman, at a combined training center located at (Cottesmore) Air Station in Great Britian. The program is designed for a 4-month period and consists of two training phases: ground training (which lasts 4 weeks) and flight training (9 weeks). In the first phase the crews study the equipment, the flight area, instructions and manuals and train on ground trainers; in the second they master the techniques for flying the aircraft and certain aspects of its combat employment. Average flight time for each student is 60 hours.

According to reports in the foreign press as many as 30 West German airman train at the center at one time. The center had graduated 125 airman for the FRG military aviation by the beginning of 1983.

The foreign press reports that tactical fighter subunits of the FRG air forces regularly train at a NATO range complex on the Island of Sardinia (Italy). They practice engaging in air battles and firing the aircraft cannons, and perform practice launchings of guided missiles.

The airbase at Beja in Portugual is used intensely for training flight personnel for the FRG air forces. Pilots of the "Alpha Jet" light ground attack aircraft receive training in its combat employment there (Figure 2). The Western press stressed the fact that the main attention is devoted to the mastery of low-altitude flights with strikes against air targets in circumstances typical for operations of this branch of the aviation when providing direct support for ground forces. The Bundeswehr presently has around 2,000 servicemen at the base.

A large range complex has been created in the area of Cold Lake Air Base in Canada. It is the opinion of the NATO experts that the countryside there is very similar

to vast areas in Europe, where they believe the main combat operations will unfold in a future war. Air force subunits of many nations in the bloc undergo training there, including the FRG. Training flights and various exercises involve practice in flying at low and extremely low altitudes, tactical techniques for overcoming a powerful enemy air defense and making strikes agaist ground targets, as well as interaction within and among groups.

The foreign press states that a total of 34,000 hours of flight time are used annually in the process of training flight personnel for the FRG air forces in the USA, with the cost of 1 hour amounting to almost 5,600 West German marks. Average annual expenditures of flight time for the training of pilots for the Bundeswehr air forces abroad amount to 8,500 in Italy, 6,000 in Great Britian, 4,600 in Portugal and 1,500 hours in Canada.

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FOREIGN MILITARY AFFAIRS

GROUND RADAR STATIONS OF NORTH AMERICAN AEROSPACE DEFENSE

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 83 pp 47-55

[Article by Eng-Col V. Tamanskiy, candidate of technical sciences: "Ground Radar Stations of the North American Aerospace Defense System"; Passages enclosed in slantlines printed in boldface in source]

[Text] Having taken a course of achieving military superiority over the Soviet Union, the military-political leaders of the USA are focusing their main efforts on building up the offensive capabilities of all branches of the armed forces. At the same time, according to reports in the foreign press, major attention is being given to the improvement and further development of the Aerospace Defense (VKO) system for the North American continent. The joint American-Canadian air and space defense command (NORAD) comprises the main body of its forces. Radar facilities designed for constantly observing aerospace, detecting and tracking ballistic missiles, space objects and air targets, issuing initial information for warning state and military control agencies of targets flying toward the North American continent, and guiding active air defense weapons to them are one of the important components of this system.

The foreign press subdivides radar stations of the North American Aerospace Defense system into three classes: systems for tracking and detecting ballistic missiles, space objects, and air targets. This classification is partly a hypothetical one, since, along with performing their own basic missions, the former can also be used for monitoring space, and the second class for detecting and tracking ballistic missiles.

/Ballistic missile detection and tracking radar stations/ form the backbone of the American system for warning of a nuclear missile attack. It includes two radar systems (BMEWS and Pave Paws) and separate radar posts with one radar station each. In addition, the multipurpose Cobra Dyne radar station is used for detecting and tracking ballistic missiles. The composition of the radar posts and points is given in Table 1.

The Western press states that the BMEWS system is designed for detecting and tracking intercontinental ballistic missiles (MBR), as well as ballistic missiles launched from submarines, in flight. The coordinates of the missile launch site, the time and place of impact of the warheads in the USA, Canada or Great Britian are calculated at the radar posts on the basis of information obtained by radar. The American experts estimate that the warning time for the system

(from the moment of detection and issuing of information on ballistic targets to the time they strike in the calculated areas) is 15-25 minutes for areas in the USA and 4-6 minutes for Great Britian. Furthermore, the system can detect and determine the flight path parameters for objects with polar or near-polar orbits. Information goes out from the system's radar posts to command posts of the Aerospace Defense system and the Strategic Air Command (SAC), as well as to the main and back-up command centers of the Joint Chiefs of Staff of the U.S. Armed Forces.

Table 1. Composition, Locations and Types of Radar Stations at Ballistic Missile Detection and Tracking Posts

Пункты дислокации радиолокационных постов (1)	Наименование (количество) станций (2)	Типы используемых станций (3)
Радиолокационная система «Бимьюс» (4)		
Клир (Аляска, США) (5)	AN/FPS-92 (1) AN/FPS-50 (3)	РЛС сопровождения (6) РЛС обнаружения (8)
Туле (Гренландия) (7)	AN/FPS-49 (1) AN/FPS-50 (4)	РЛС сопровождения РЛС обнаружения
Файлингдейлз-Мур (Великобритания) (9)	AN/FPS-49 (3)	РЛС сопровождения
Радиолокационная система «Пейв Пос» (10)		
Авиабаза Билл (Калифорния, США) (11)	AN/FPS-115 (1)	РЛС обнаружения и сопровождения (12)
Авиабаза Отис (Массачусетс, США) (13)	AN/FPS-115 (1)	То же (14)
Отдельные радиолокационные посты (15)		
Авиабаза Гранд Форкс (Северная Дакота, США) (16)	«Паркс» (17)	РЛС обнаружения и сопровождения
О. Шемия (Алеутские о-ва, США) (18)	«Кобра Дейн» * (19)	То же
Авиабаза Мак Дилл (Флорида, США) (20)	AN/FSS-7	РЛС сопровождения

*Multipurpose radar stations for surveillance, and tracking space objects and ballistic missiles.

KEY:

1. Radar post locations
2. Designation (number) of stations
3. Types
4. BMEWS radar system
5. Clear, Alaska, USA
6. Tracking radar
7. Thule, Greenland
8. Surveillance radar
9. (Faylingdeylz-Mur), Great Britain
10. Pave Paws radar system
11. Bill Air Base, California, USA
12. Surveillance and tracking radar
13. Otis Air Base, Massachusetts, USA
14. The same
15. Separate radar posts
16. Grand Forks Air Base, North Dakota, USA
17. Parks
18. Shemia Island, Aleutian Islands, USA
19. Cobra Dyne
20. McDill Air Base, Florida, USA

The main function of the Pave Paws radar system is surveillance and the tracking of ballistic missiles launched from submarines. Its radar stations are also used for surveillance and the tracking of space objects in the interest of monitoring space. The data obtained are used for calculating the coordinates of the areas and the time of impact of the warheads in the USA. Warning time is 12-15 minutes.

The AN/FSS-7 radar station of the 474N system, which is considered to be obsolete in design and technical characteristics, is also used as a means of surveillance and of tracking ballistic missiles launched from submarines.

The radar posts of the nuclear missile warning system are broken down into three types, depending upon their characteristics: posts for detecting ballistic missiles in flight, for tracking detected missiles, and for simultaneously tracking and detecting missiles.

The first type of stations are the AN/FPS-50 radar stations (Figure 1[figures not reproduced]), which have an antenna system with a reflector in the form of a parabolic torus and a multi-support, organ-type exciter. The antenna creates two narrow beams at different angles. By systematically delivering electromagnetic oscillations to the radiating horns, the beams simultaneous scan an azimuthal sector of around 40 degrees. The use of the two narrow beams makes it possible to compute, in addition to range, angular coordinates and speed and the flight path of targets, also the launching areas and the time and place of their impact. The station functions in a pulsed mode. Signals reflected from the target pass through a receiver, where they are amplified and converted, go simultaneously to a Doppler frequency analyzer, by means of which the target's radial velocity is determined. The signals then undergo further processing to measure the target's range and azimuth. The data obtained are used for working out commands for plotting for the ballistic missile tracking radar.

The AN/FPS-49 radar station is the most typical of the second type. It has a multipulse mode of operation. Its antenna system consists of a round, parabolic reflector beneath a radio-permeable dome 43 meters in diameter, irradiated by four horn exciters, and several focus-displaced reflectors. The creation of four narrow beams makes it possible to achieve a fairly high level of target tracking accuracy. The radar station's transmitting device generates frequency-modulated pulses. The signals are filtered in the receiver, which makes it possible to achieve an adequate discriminating capacity with respect to range, with a lengthy pulse, and great effective range with emissions of relatively low strength in the pulse. There is an auxiliary mode in addition to the main mode of operation (tracking)--detection of ballistic targets. In this mode it is possible to scan space azimuthally at a speed of 10 degrees per second by rotating the antenna system horizontally.

Stations of the third type simultaneously detect and track ballistic targets. They include the AN/FPS-115 (of the Pave Paws system), the Cobra Dyne and Parks. They use antennas with electrically controlled radiation patterns, which are of flat design and have radiating and receiving elements with multiple-component arrays, called phased antenna arrays (FAR). In these antennas sharp radiation directivity is combined with an antenna beam which sweeps rapidly in a preset sequence and scans an extremely wide sector of space with the antenna stationary.

Another feature of this type of station is their great power and the extensive range of signal radiation frequencies, achieved mainly with intra-pulse modulation. The use of such signals makes it possible, with optimal processing of the signals reflected off ballistic targets, to achieve a good discrimination capacity for range and speed. The rapid scanning of space, the use of complex radiated

signals of variable length and the limited amount of time for processing the radar information and obtaining the computed data make it necessary to use high-performance computer systems capable of performing several million operations per second in the radar stations.

Along with their common features, each of the stations has its own specific characteristics, which make their mark on the tactical and technical data (presented in Table 2) and the missions they perform. According to reports in the foreign press, for example, the Parks radar station (Figure 2) performs adequately with respect to tracking and discrimination capacity for range and speed with a warning time of 6-12 minutes. It is designed mainly for determining the space-time characteristics of a nuclear missile attack. This mission is performed with complex algorithms and programs underlying specific methods for processing information and generating output data in the various phases in the tracking of targets detected by the station.

Table 2. Tactical and Technical Data for Ballistic Missile Detecting and Tracking Radar Stations

Наименование РЛС, год принятия на вооружение (1)	(2) Дальность обнаружения, км	мощность излучаемых сигналов в импульсе (средняя), МВт (3)	(4) Частота излучаемых сигналов, МГц	диаметр или ширина × высота антенны, м (5)	(6) Длительность импульса, мкс	частота повторения импульсов, Гц (7)	Ширина диаграммы направленности антенны, град: по азимуту (8)	(9) по углу места	Сектор обзора по азимуту (по углу места), град (10)	количество сопровождаемых целей (11)
AN/FPS-49, 1960	Около 5000	1 (0,3)	425	25	Переменная (12)	27	2	2	360 (90)	1
AN/FPS-50, 1960	5400	5 (0,3)	425	122 × 50	2000	27	1	2	40	—
AN/FPS-92, 1966	Около 5000	1 (0,3)	425	25	Переменная	27	2	2	360 (90)	1
AN/FPS-115, 1980	4800	0,6 (0,15)	420—450	31	•	•	2	2	240 (3—85)	100
«Кобра Дейн», 1977 (13)	3700	16	1175—1375	30	Переменная	переменная	0.6	0,6	120 (3—85)	200—300
«Паркс», (14)	4200	10	425	•	Переменная	•	•	•	110—140	(15) более 300

KEY:
1. Designation, year received by services
2. Detection range, kilometers
3. Strength of signal in pulse, (average), megawatts
4. Signal frequency, megacycles
5. Diameter or width and height of antenna, meters
6. Length of pulse, mks
7. Pulse repetition frequency, hertz
8. Width of antenna, degrees, for azimuth
9. For angle of elevation
10. Scanning sector (for angle of elevation), degrees
11. Number of targets tracked
12. Alternating
13. Cobra Dyne
14. Parks
15. More than

According to the foreign press the AN/FPS-115 Pave Paws radar station is distinguished by its long range, broad azimuthal scanning sector, the use of modern technology for producing the components, the use of a complex antenna system consisting of two phased antenna arrays, and a powerful computer system.[1] Structurally, it has the form of a building of complex configuration more than 31 meters tall, shaped like a trapezoid at the bottom and a triangle at the top. The phased antenna arrays are located on the building's two sloping walls, with each array generating an antenna beam for scanning a sector of 120 degrees. For detecting ballistic missile launchings a barrier is created in the form of a fan of horizontal beams with a horizontal angle of 3 degrees. The electronic computer system controls the phase, the amplitude and the length of the signals. This makes it possible, with rapid, intermittent shifting of the beam within the scanning sector, to detect and track targets with the signals emitted at optimal strength.

In the opinion of the American military experts existing ground radar systems for warning of nuclear missiles do not fully measure up to the demands made of them. A comprehensive program is therefore underway at the present time to perfect them and deploy new stations (It is planned to spend around 1.2 billion dollars on the program up to fiscal year 1986.). The main objective of the program is to enhance accuracy in the evaluation of the space-time characteristics of a nuclear missile attack and to enlarge the zone of aerospace scanned by the system. The latter will be accomplished, among other things, by deploying two additional Pave Paws radar systems: one in the southeastern part of the United States, the other in the southwestern part.

It is planned to enhance accuracy in the evaluation of the characteristics of a nuclear missile attack mainly by modernizing existing radar facilities. The plans include projects aimed at improving the capabilities of the radar stations with respect to accuracy for measuring the coordinates and parameters of the trajectories of targets, their discrimination capacity and the number of targets which can be tracked simultaneously.

Judging from articles in the foreign press, the primary task in the modernization of the BMEWS stations is to enhance their discrimination capacity. For this purpose it is planned to improve the transmitting and receiving devices of the radar stations, their antenna systems and data processing equipment. It is believed that after modernization the discrimination capacity for range will be at least 2 kilometers. It is planned to achieve this by expanding the range of the signals emitted by intra-pulse modulation. The American experts believe that with such a discrimination capacity it will be possible to classify and track multiple-element and separating missile warheads.

It is planned to use a second frequency range (1,000-2,000 megacycles) in the tracking radar system (the AN/FPS-49 and -92) to enhance precision in the measuring of the flight path coordinates and parameters of targets. This range will be used only for the precise measurement of coordinates and parameters of the flight paths of ballistic targets, in order to provide the more precise output data essential for computing points and times of impact of warheads on the North American continent. In addition, it is planned to replace the present, obsolete electronic computers with a capacity of 0.15 million operations per second, which

1. For a more detailed description of this radar station read ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No. 5, 1983, pp 53-54.--Editor

are presently in use at the radar posts, with modern computer systems made up of two electronic computers with a combined capacity of at least 2 million operations per second.

The Parks radar station must be modernized in order to improve its discrimination capacity and detection range for ballistic targets. After the station has been improved, the foreign press reports, it will be able to determine the flight path parameters of ballistic targets at a range of around 4,000 kilometers (3,000 kilometers prior to the modernization).

/Radar stations for detecting and tracking space objects/ have been set up at radar posts of the SPADATS space detection and tracking system, which includes the Air Force Spacetrack and the Navy SPASUR subsystems.[2] According to the design features the Western experts subdivide these radar stations into three types: detection, tracking, detection and tracking of space objects.

The AN/FPS-17 radar stations of the Spacetrack subsystem (located on the Aleutian Island of Shemia and at Diyarbakir, Turkey) and the phasometric system of the SPASUR subsystem are used for detecting space objects. The AN/FPS-17 is similar to the AN/FPS-50 ballistic missile detection station in its operating principle and design. The antenna system, which consists of a reflector in the form of a truncated torus 33 meters long and 55 meters high, and a multiple-horn radiator, generates two barrier beams with a 10 degree difference in angel of elevation. An azimuthal scanning sector of around 20 degrees is achieved by the systematic delivery of electromagnetic oscillations to the horns.

The phasometric complex of the SPASUR subsystem, positioned at 33 degrees north latitude (in the southern part of the USA), includes three transmitting and six receiving centers. The transmitting centers emit powerful, continuous signals and create a solid vertical radar barrier along the southern border of the USA (narrow in the north-south direction) by means of multiple-component, extended antenna systems of half-wave oscillators. Signals reflected off space objects passing through the barrier beam are received by receiving centers, where their amplitude and phase are measured. The derived parameters are transmitted to a control and processing center in Dahlgren, Virginia. The coordinates of the space objects are determined at this center by comparing the phases of the signals received at various centers. At least two observations of space objects in different loops are required for measuring the parameters of orbits. The foreign press reports that the phasometric system provides for detecting and determining the orbits of space objects at altitudes up to 10,000 kilometers.

The space tracking radar (AN/FPS-79 and -80) were developed out of the AN/FPS-49 ballistic missile tracking station and are similar to it in design, operating principle and technical characteristics. They are located on the Aleutian island of Shemia and at Diyarbakir, Turkey. It is believed that they have a small capacity for tracking space objects, since they can track only a limited number of targets simultaneously.

The AN/FPS-85 station with a phased antenna array is used for detecting and tracking space objects (Figure 3). Unlike similar stations used in the nuclear missile

2. Radar stations of the nuclear missile warning system and those of space rocket testing grounds and civilian research organizations are also used for monitoring space.

warning system, the AN/FPS-85 has two phased antenna arrays, one of which is in the shape of a square with a side of around 30 meters and is used for emitting pulse signals with a power of 32 megawatts, while the other (a regular octagon with a side of around 25 meters) is used for receiving signals reflected off space objects. The width of the radiation pattern of the transmitting array is 1.4 degrees, that of the receiving array--0.8 degrees. The wall of the building (on which the phased antenna arrays are located) is inclined 45 degrees to the earth's surface. The station has an azimuthal scanning sector of 120 degrees and a sector of 105 degrees for angle of elevation. The station is used for detecting, measuring the coordinates of and tracking space objects at altitudes of up to 5,000 kilometers. All of the processes have a high degree of automation, which is provided by a computer system consisting of four IBM 360/65 electronic computers with a capacity of around 4-5 million operations per second.

The American experts believe that the main deficiency of the radar stations for monitoring space is their limited vertical range (They are incapable of detecting and tracking space objects at altitudes above 10,000 kilometers.). When they are improved, it is therefore planned to increase their strength. In addition, optico-electronic devices are used for detecting and tracking space objects at great altitudes (even in geostatic and greatly elongated elliptical orbits with altitudes of 36,000-40,000 kilometers).

According to reports in the foreign press a program is presently being implemented to create five optico-electronic posts for detecting and tracking space objects. Each post will include two 101.6 cm telescopes with a 2 degree field of vision and one 38.1 cm telescope with a 6 degree field of vision. The larger telescopes are designated for detecting and observing space objects in high orbits with a low angular speed of movement relative to the earth's surface, while the small telescope is to be used to search for, detect and track space objects in lower orbits and moving at a relatively high angular speed. When the equipment was developed steps were taken to automate the processing of information received at the posts. This will make it possible to transmit data on the parameters of the space objects to the appropriate command posts within a nearly realistic time scale (With the optical posts previously used, data were held up from several hours to several days.). The information is processed at the posts by computer systems consisting of four PDP 11/70 electronic computers with a capacity of 400,000 operations per second each.

Overall, according to the Western press, the program for improving means of monitoring space will cost the American tax payer almost 1 billion dollars between fiscal years 1981 and 1986.

/Radar stations for detecting and tracking air targets/ are designed for observing the air space on the approaches to and above the North American continent. Data on the air situation obtained by means of these stations are transmitted to air defense district (sectorial) control centers, where they are processed with electronic computers and used for directing subordinate troops and facilities, warning military and civilian control agencies of an air enemy, and directing fighter aircraft to the air targets detected.

According to reports in the American press three types of radar stations are used for air defense in the USA and Canada: double-coordinate stations for

detecting targets and determining their azimuth and range (Figure 4); triple-coordinate stations, which also measure the target's altitude and angle of elevation; and stations for determining the altitude of air targets (radar altimeters). The basic technical data for the most commonly used stations are given in Table 3.

Table 3. Tactical and Technical Characteristics of Air Target Detecting and Tracking Radar Stations

(1) Обозначение РЛС	(2) Дальность действия*, км	(3) мощность в импульсе, МВт	(4) Длина волны излучаемых сигналов, см	(9) длительность импульса, мкс (частота повторения импульсов, Гц)	(5) Скорость вращения антенны, об/мин	(6) сектор обзора по углу места, град	(7) Ширина луча диаграммы направленности, град: по азимуту	(8) по углу места
Двухкоординатные РЛС (10)								
AN/FPS-19	200	0,5	23	2; 4 (200; 400)	6	18	1,3	18
AN/FPS-20	300	2,5	23	6 (180—360)	До 10	21	1.3	21
AN/FPS-24	•	5	•	6; 18 (278)	До 5	30	2.9	30
AN/FPS-27	500	15	10	3, 6 (330)	5	34	1.0	34
AN/FPS-35	•	5	27	24 (330)	5	•	1.5	•
ARSR-3	440	5	23	2 (350)	5	44	1.25	44
Трехкоординатные РЛС (11)								
AN/FPS-7	400	10	23	6 (360)	До 15	18	1.3	18
Радиолокационные высотомеры (12)								
AN/FPS-6	300	5	10	2—3 (300)	6	32	3.2	0,9
AN/FPS-26	400	5	5	4 (330)	5	•	2,3	•
AN/FPS-89 (90)	400	4	10	2 (400)	6	32	3.2	0,9

* For a target with an effective reflecting surface of 3 square meters.

KEY:
1. Radar designation
2. Effective range, kilometers
3. Pulse energy, milliwatts
4. Wave length of signals emitted
5. Antenna rotation speed, rpm
6. Scanning sector for angle of elevation, degrees
7. Width of directional pattern, degrees: for azimuth
8. For angle of elevation
9. Pulse length, mks (pulse repetition frequency, hertz)
10. Double-coordinate radar
11. Triple-coordinate radar
12. Radar altimeters

These radar stations are deployed at radar posts of the DEW (Distant Early Warning) line (the line consists of 31 posts stretching 5,700 kilometers along the 70th parallel) on the western and eastern borders of the USA and Canada and the southern border of the USA, as well within the interior air defense districts.

The radar posts along the American-Canadian border form a second line, called "Pine Tree," of air target detection (24 posts). The American press states that control and warning radar posts are the most common (which mainly have the double-coordinate radar and radar altimeters). Detection and warning radar posts are also in use. They are deployed primarily on the DEW line, as well as in the continental USA (five posts) and Alaska (one post). More than 110 radar posts in all are used for the air defense of the North American continent.

According to articles in the foreign press, the existing network of posts and the stations set up there do not fully meet the requirements set for them by the military command of the USA and Canada. Among other things, it is felt that the radar stations presently in use have an inadequate discrimination capacity, inadequate accuracy for determining the coordinates of air targets, an inadequate range for detecting small (with a small effective reflecting surface) and low-flying targets, poor resistence to jamming and low reliability. This necessitates the use of a considerable number of personnel for manning the operations shifts and for the technical servicing and repair. In order to eliminate these deficiencies the USA and Canada are engaged in a system of measures within the framework of several programs for modernizing and further developing radar facilities for detecting and tracking air targets.

It is planned to enhance the discrimination capacity, the accuracy of coordinate determination, resistance to jamming and reliability of ground radar stations mainly by adopting new radar stations. It is planned to take into account in their development modern achievements in the fields of microelectronics, radar technology, the development of equipment and methods for processing radar signals, and the monitoring of the functioning of the separate assemblies and units and the stations as a whole.

The programs for replacing radar stations in the Alaskan Air Defense District (Seek Igloo) and the DEW line (Seek Frost), for example, call for deploying the new AN/FPS-117 triple-coordinate radar stations at the radar posts. These use the phased antenna array system with an electrically controlled directional pattern on the elevation angle plane. All-round scanning is accomplished with the antenna's mechanical rotation azimuthally. The American experts believe that the employment of signals with intra-pulse modulation and a sharp directional pattern in the vertical and horizontal planes will make it possible to achieve a good discrimination capacity and accuracy in determining the coordinates of air targets (The distance to the target can be determined with an accuracy of plus or minus 30 meters, for example, and the discrimination capacity with respect to range will be plus or minus 60 meters.).

It is planned to enhance the operational reliability of the radar stations by using solid-state components (The average time of operation to breakdown will be increased to several thousand hours.) and with the extensive use of built-in monitoring equipment for all the station's assemblies and units. In the operational process the latter will make it possible to automatically monitor the efficiency of the radar station every minute by means of electronic computers and to reduce the average time required to restore it to 20-40 minutes. Resistance to jamming will be increased by creating a narrow directional pattern and reducing the level of emissions to its side vanes, and by employing high-powered, complex signal emissions and the proper equipment and algorythms for processing the signals reflected off the air targets.

The creation and deployment of radar stations with good operational reliability will make it possible not only to improve the capabilities of the radar facilities for detecting air targets, but also to significantly reduce the number of personnel on the operations shifts, technical servicing and repair personnel. According to information published in the American press, for example, when the obsolete double-coordinate stations and radar altimeters at the 13 radar posts in the Alaskan Air Defense District are replaced, it is planned to reduce the number of personnel employed at the posts from 570 to 95, and the latter will only perform technical servicing and repair work. According to the specifications no more than 100 hours should be allocated annually for the technical servicing and repair of a single radar station. In the operational mode the stations will function automatically, issuing data on the air situation to the air defense district's control center, located at Elmendorf Air Base.

Expanding the use of radar posts for air defense and for controlling air traffic is another method of reducing the number of personnel. Under the JSS (Joint Surveillance System) program, for example, it is planned to increase the number of radar posts used jointly by the Air Force and the federal Civil Aviation Administration in the continental USA from 10 to 35.

In the process of improving the radar stations special attention is being given to increasing the detection range for air targets, especially low-flying targets. This is being achieved by selecting types of ground stations (including over-the-horizon stations) and sites of deployment, and by employing radar stations on captive baloons and AWACS E-3 long-range radar spotting and control aircraft.

The program for replacing and developing radar stations for the DEW line calls for deploying more than 35 service-free or minimal-service radar stations among the 13 early warning radar posts for creating solid radar coverage at low altitudes. With the appropriate selection of radar facilities and deployment sites it is planned to create a line for detecting low-flying air targets at distances of 50-80 kilometers.

The foreign experts calculate that the use of radar on captive baloons raised to an altitude of 3,000-4,000 meters (one such post has already been set up in Kujo Key, Florida) will make it possible to achieve a detection range of more than 240 kilometers for low-flying air targets. These stations are not widespread at the present time, however.

The U.S. Air Force command is pinning special hopes for increasing the range of air target detection, including low-flying targets, with the deployment of ground over-the-horizon radar stations with inclined backscatter sounding, which operate in the short-wave range. Specifically, under the 414L program it is planned to deploy two over-the-horizon radar stations: one in the northeastern part of the continental USA (in the state of Maine), the other in the northwestern part (Washington). The former is already in experimental operation. Each of the stations will have an azimuthal scanning sector of 60 degrees and will be able to detect air targets at distances of up to 4,000 kilometers. In the operational employment of these radar stations target designation data will be issued to ground control centers or E-3 aircraft for guiding air defense fighters to the targets.

The capabilities of ground radar for detecting low-flying targets are being substantially enlarged by using the AWACS (flying at altitudes of 8,000-9,000 meters, they have a detection range for low-flying targets of around 400 kilometers). The airborne radar equipment and methods used for processing the radar signals make it possible to detect low-flying targets flying at speeds of at least 170 kilometers per hour. The foreign press reports that modernization of the station has made it possible to detect air targets moving at considerably lower speeds.

The information provided in this article is further proof of the fact that in its overall system of militaristic preparations the USA is devoting serious attention to the improvement and further development of radar for detecting and tracking ballistic missiles, space objects and air targets, for which purpose considerable appropriations are being designated. The program for developing ground, air-target detection radar (including over-the-horizon radar) will cost the U.S. Defense Department around 2 billion dollars.

11499
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NATO EXERCISE 'OCEAN SAFARI'83'

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 83 pp 57-60

[Article by Capt 2d Rank V. Tomin: "The NATO Exercise 'Ocean Safari-83'"]

[Text] Ruling circles of the aggressive North Atlantic alliance regard the Atlantic as the main ocean theater of war. In the assessment of Western military experts, its importance is due primarily to the fact that lines of communication pass through the Atlantic, over which it is planned to carry out the strategic movement of troops and cargo from the USA and Canada to reinforce the grouping of the bloc's OVS (Joint Armed Forces) in Europe. Lines of communication in the Atlantic link the industrial regions of the North American continent with Europe, Africa and the Near East. They are used for delivering various kinds of raw materials, primarily oil and petroleum products, for the NATO nations. In view of the great length of their ocean lines of communication, their high degree of vulnerability and also the acute need to move large bodies of troops, weapons and ammunition to Europe over these routes in case of a war, the bloc's command is working out various alternatives for protecting them during regular exercises and maneuvers conducted in peace time.

In the opinion of the NATO experts the uninterrupted functioning of the lines of communication in the Atlantic can be assured only with the comprehensive accomplishment of the tasks of gaining supremacy in individual regions, systematically searching out and destroying enemy submarines on the convoy routes and at the most important communication centers, as well as by organizing an escort service and with the combined use of all modern means of ocean warfare.

Out of the large number of exercises and maneuvers of various kinds and scales carried out by the North Atlantic bloc in 1983, the Western press singles out the NATO naval exercise code-named "Ocean Safari-83" held from 7 to 17 June in the waters of the East and Iberian Atlantic. Its main objective was to test and practice plans for converting the bloc's Joint Armed Forces from a peacetime to a war footing, to reinforce them, deploy them operationally in the areas of their combat designation and employ them in the first operations of the initial period of a limited war not involving nuclear weapons.

The following matters received the main attention during the exercise: combating "enemy" surface ships and submarines for gaining supremacy in the most important zones of ocean communications in the East and Iberian Atlantic; the rendering of direct air support for ground forces in the Central European TVD (Theater of

military operations) with carrier-based aircraft; the escorting of convoys with reinforcement troops, military and economic cargo from the East Coast of North America to Europe; the conduct of anti-mine operations in the forming-up areas for convoys and on their routes of travel to the ports of destination, as well as all types of defense for ship formations and convoys on ocean crossings; the organization of control and communication; reconnaissance and materiel support.

The commands and the staffs of the joint and national naval forces, NATO's strike force in the Atlantic, the bloc's permanent naval formation in the Atlantic and NATO's permanent mine sweeping force in the area of the English Channel (around 25 thousand men were activated in the exercise. The following participated in the exercise: more than 90 ships and auxillary vessels (including four aircraft carriers--the American multipurpose John F. Kennedy and the French Foch--two British ASW ships--the Hermes and Illustrious--and the American headquarters ship Mount Whitney; more than 300 aircraft and helicopters of the naval aviation and air forces of the USA, Great Britian, Canada, the FRG, Denmark, Norway, the Netherlands, Belgium, Portugal and France; personnel and facilities of NATO's Atlantic Air Defense Zone; and E-3A long-range radars spotting aircraft (AWACS).

General supervision of the exercise was performed by American Admiral McDonald (headquarters in Norfolk in the USA), supreme commander of NATO's Joint Armed Forces in the Atlantic, and indirect control of operations was excercised by the commanders in chief of NATO's Joint Armed Forces in the East Atlantic (Northwood, Great Britian) and the Iberian Atlantic (Lisbon, Portugal), as well as the commander of NATO's assault fleet in the Atlantic. (A field headquarters on the ship Mount Whitney).

In accordance with the exercise scenario, which was based on a concept of provocation, the "enemy" occupied a part of the FRG with suprise combat operations in Central Europe, deployed surface ship and submarine groupings in the North and Central regions of the East Atlantic and began active offensive operations to dislodge and destroy the bloc's naval forces there. In the situation which developed the NATO command decided to carry out emergency reinforcement of its forces in the East and Iberian Atlantic and to move strategic reserves from the USA to the European Theater of War by sea. Steps were simultaneously taken to prevent a build-up of "enemy" naval forces in the Northeast Atlantic and on the Eastern approaches to the Straits of Gibraltar. The bloc's naval forces managed to route the "enemy's" main ship groupings and prevent their redeployment, thereby ensuring the uninterrupted functioning of ocean lines of communication over which reinforcement troops are moved to the Central European TVD and to ports in the nations of Southern Europe.

In the preparatory stage which preceded the main phase of the excercise, NATO's naval forces in the East and Iberian Atlantic were reinforced by moving part of the U.S. and Canadian ships from the East coast of the North American continent. During the partial exercise "Joint Effort-83" (23 May-6 June), for example, 20 American and five Canadian ships and auxillary vessels and transports organizationaly combined into a joint operational formation traveled from the West Atlantic to European waters. The backbone of the formation consisted of a

multipurpose aircraft-carrier group (the aircraft-carrier John F. Kennedy and escort ships--the guided missile cruiser Biddle and the battleships Musbragger and Comte de Grass--the frigates MacCloy and Eilwin and others), as well as an ocean convoy which included vessels and transports of the above nations. In addition, the formation included a British ASW aircraft-carrier group (the aircraft-carrier Hermes), which was in the Western Atlantic at that time. Several American nulcear-powered submarines were also deployed in the East Atlantic. One of the submarines was attached to the escort forces for the John F. Kennedy. The multipurpose and ASW aircraft-carrier groups secured the convoy's transatlantic passage, during which they practiced all type of defense against attacks by "enemy" submarines, surface ships and aircraft, searched for and destroyed the "enemy's" groupings of deck-based aircraft operating from aircraft-carriers.

The air grouping in the exercise area was reinforced with several squadrons of costal patrol and tactical aircraft of the USA, Canada and the Netherlands, which flew to air bases in Iceland, Spain and Portugal before the exercise began.

A NATO strike force was created in the Atlantic with the arrival of a joint operational formation in the area of the Azores. It consisted of the following groups: the American multipurpose aircraft-carrier John F. Kennedy and the French aircraft-carrier Foch and two British ASW ships, the Hermes and the Illustrious). It was responsible for creating good operational conditions on the route of travel for the ocean convoy from the Azores to ports in Western Europe (ships and aircraft of the strike fleet were assigned the missions of covering the convoy and gaining supremacy in the Bay of Biscay and the Iberian Atlantic). For inflicting strikes against "enemy" ships the deck-based aircraft operated as strike forces (with 3-12 Intruder ground-attack aircraft in each). The strikes were made with guided aerial bombs and Harpoon anti-ship missles from one or several directions. The aircraft flew to the area for launching the anti-ship missiles (70-120 kilometers from the target) at low altitude, while the launch was made from altitudes of 100-800 meters.

The NATO command deployed up to five hunter-killer groups (with two to three ships in each) and stepped up flights by deck-based aircraft in an attempt to prevent the "enemy's" submarines from penetrating to the zone of intensive naval communications south of Great Britian.

Several convoys (five to twenty vessels and transports in each) were organized when the protection of these lines of communications was being practiced. Their main crossing routes were the following: Great Britian-Azores, Azores-coast of Portugual, area of English Channel-coast of Portugal. For purposes of ensuring the vessels' security around ten additional strike groups were set up near these routes in addition to the ships in the strike fleet, which covered the lines of communication on the north, east and south. Air defense was carried out by deck-based aircraft from multipurpose and ASW aircraft-carriers interacting closely with shore-based fighters. The escorting of the convoys took place in a situation of active operations by the "enemy's" submarines, strike groups and aircraft.

The Western press notes that the nature of the missions practiced in the exercise demonstrates the fact that the NATO command attaches exceptional importance to

the continued improvement of tactics for using ASW forces for seeking, tracking and destroying enemy submarines as they leave naval bases, on routes of deployment and in the areas of their combat designation. ASW task forces (surface ships, submarines and costal patrol aircraft) were enlisted for the performance of these missions, as well as the SOSUS permanent long-range sonar observation system, which interacted closely with them. The foreign military experts say that the technical facilities of the latter made it possible to gather and analyze information on sonar contacts from the entire exercise area.

Hunter-killer groups (with two to three ships in each) deployed to the southwest of Great Britian and west of France at positions and in designated 100-X170 mile areas designated for them provided security for the maneuvering of the ships in the strike fleet, which was performing missions involved in gaining supremacy in the Bay of Biscay and on the western approaches to the English Channel. The aircraft-carrier Hermes was periodically designated to provide ASW cover. Costal patrol aircraft operated practically throughout the entire exercise area, both separately and as part of air hunter-killer groups. They searched for submarines by means of sonobuoys, magnetic detectors and radar, and used ASW torpedos and depth charges to destroy them.

With the gaining of supremacy in the Bay of Biscay aircraft from the aircraft carrier John F. Kennedy were reassigned to provide direct air support for ground forces in the Central European Theater of Military Operations. Deck-based A-6E Intruder ground-attack aircraft struck at designated ground targets in the FRG in assault groups consisting of eight to ten aircraft.

The foreign press reports that they were refueled in the air over France by American KC-135 tankers. According to American Admiral D. (Fletley), the flight and the refueling of the A-6E Intruders of the U.S. Navy over the territory of France were the first since 1966.

During the excercise special attention was devoted to anti-mine support for the aircraft-carriers and ASW forces, as well as the convoys. These missions were performed by NATO's permanent formation of mine-sweeping forces in the area of the English Channel and minesweepers of Great Britian, Belgium, Portugual and France. Before the ships entered or departed naval bases and ports or their designated combat areas, check sweepings were ordinarily made on the approaches to them. Minesweepers made reconnaissance sweeps for mines in order to detect mine fields, determine their diminsions and configurations on the routes of the convoys, and anchorage sites and in the areas of ports where reinforcement troops and combat equipment were unloaded. The sweeping was carried out by minesweeping groups (two-four ships in each) and separate minesweepers using acoustic, contact and electromagnetic sweeps. Divers/demolition experts and combat underwater mine-clearing and demolition specialists from the Portuguese Navy were enlisted for deactivating ground and moored mines in certain cases. The convoys and individual ships carrying the most valuable cargos traveled behind sweepers in areas with the greatest likelihood of enemy mine fields.

B-52 aircraft of the U.S. Strategic Air Command, minelayers and submarines were used for creating mine danger (minelaying). The B-52 bombers flew nonstop from airbases in the USA and back, refueling in the air from KC-135 tankers.

ASW defense, air defense, anti-missile and ASW defense for the ships, formations and convoys were extensively practiced in the exercise. The air defense was performed by the escort forces interacting closely with the forces and facilities of NATO's Joint Air Defense System. Immediate security for the aircraft-carriers was provided by escort ships, strike groups and hunter-killer groups assigned to the threatened axes; long-range security, by costal patrol aircraft, nuclear-powered submarines and deck-based ASW Viking aircraft from the combat air patrols. Taking into account the experience of the Anglo-Argentine conflict, a deeply echeloned air defense zone was created for the early detection of air targets and for guiding fighters to them. E-3A AWACS aircraft and radar surveillance ships moved to the threatened axes were used for this purpose. This permitted the timely detection and interception of air targets before they came within range of their airborne weapons, primarily anti-ship missiles.

Materiel support for the ships was provided by the corresponding nations, both at naval bases and in ports and in the areas of combat maneuvering at sea. Fuel and supplies were ordinarily transferred on the move by means of traverses or vertically (from helicopters). Reliable air and ASW cover was provided for the ships while they were refueling.

Reconnaissance, the organization of patrols by heterogeneous and multinational forces and interaction among the branches of armed forces were also practiced in the exercise. Active use was made of radioelectronic counteraction equipment for the operations by naval forces, which has been a typical feature of all operational and combat training activities for NATO's Joint Naval Forces in recent years.

The nature of foreign reports on exercise "Ocean Safari-83" demonstrates the NATO command's concern about constant accidents and near-misses in the naval forces. In one phase of the exercise in the Bay of Biscay, for example, a British Sea Harrier aircraft based on the ASW aircraft carrier Hermes suffered an accident, for example. The pilot ejected from the aircraft. Another aircraft of Great Britian's air force lost contact and lost its bearings and made a forced landing on a Spainish merchant vessels. While landing on the aircraft carrier John F. Kennedy an American A-6E Intruder ground-attack aircraft lost its left wheel, was forced to make a second approach and made an emergency landing. Because of a malfunction another A-6E Intruder managed to land by means of an emergency landing device only after the fifth approach.

The exercise "Ocean Safari-83" by NATO's Joint Naval Forces was conducted against a background of growing war hysteria initiated by the Reagan administration. It is clear from foreign press reports that its main political objective was that of demonstrating the readiness of the North Atlantic bloc and the USA "to protect the national interests" of the participating nations in Western Europe and to provide for the prompt transfer of its strategic reserve to any European Theater of Military Operations in case of war.

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'SEA HARRIER' AIRCRAFT FOR BRITISH ASW AIRCRAFT CARRIERS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 83 pp 61-65

[Article by Col (Reserve) I. Kutsev: "The 'Sea Harrier' Aircraft for ASW Aircraft Carriers of Great Britain's Navy"]

[Text] In the 1970s Great Britain's Navy command expanded the development of new forces and means of ocean warfare and the improvement of existing forces and means. Special attention was given to the building of Invincible class ASW aircraft carriers and outfitting them with planes and ASW helicopters. In the opinion of foreign military experts this made it possible to enhance the combat capabilities of the naval forces with respect to ASW and anti-aircraft defense for task forces and the protection of naval lines of communication.

The program called for the construction of three new ASW aircraft carriers: the Invincible (commissioned in 1980), the Illustrious (1982) and the Ark Royal, the construction of which is scheduled for completion in 1985. In addition, the landing helicopter carrier Hermes (see colored insert [inserts not reproduced]) was modified as an ASW aircraft carrier in 1980.

Along with the construction of aircraft carriers an aircraft was developed, which conformed to the maximum possible degree to requirements for compatibility with ships. The displacement of the Invincible class of air craft carriers (19,500 tons), the length of the flight deck (around 170 meters) and the absence of a catipult and arrester wires on it precluded the use on the aircraft carriers of aircraft with conventional take-off and landing and determined the selection of their design.

In order to reduce the time and the cost of development, the Harrier, a well-known aircraft with verticle or short take-off and landing was taken as the basic model. The design features of the new aircraft, given the designation "Sea Harrier-FRS.1," are given in Figure 1. It is a multipurpose aircraft designed for use as a fighter, a ground attack or reconnaissance aircraft.

Development of the Sea Harrier was begun in 1975 and completed in the summer of 1978. The flight testing of experimental models continued around 2 years. The naval forces received the first series-produced aircraft in June of 1979. A total of 34 combat aircraft and four Harrier-T.Mk4 two-seater trainers were initially ordered, and their delivery had been completed by May of 1982.

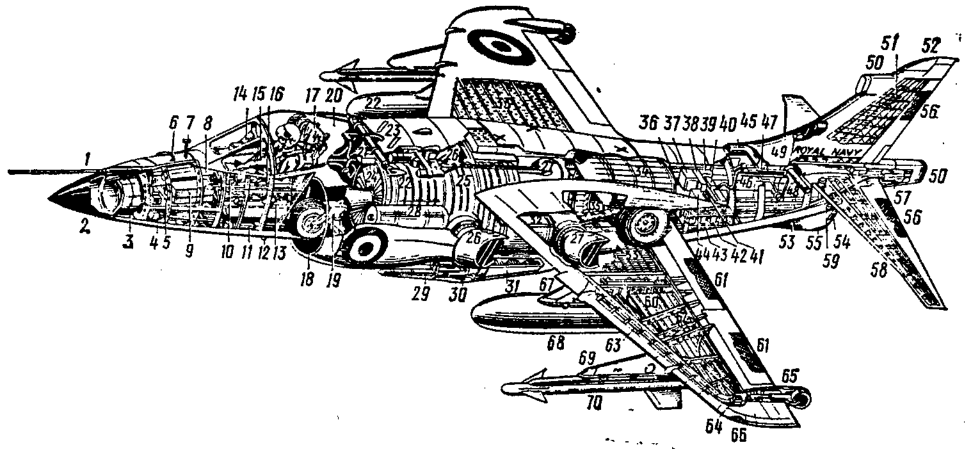

Figure 1. Breakdown of Sea Harrier-FRS.1: 1. Pilot-static head; 2. Nose fairing; 3. Blue Fox radar system; 4. Pitch control valve; 5. F95 camera; 6. Antenna of identification system; 7. Yaw control sensor; 8. Radar information display; 9. Gyroscope-stabilized platform; 10. Weapons control panel; 11. Doppler radar; 12. TACAN navigation system antenna; 13. Automatic-pilot control lever; 14. Pilot's optico-electronic indicator; 15. Computer for navigation equipment; 16. Levers for controlling engine and deflecting exhaust nozzles; 17. Ejection seat; 18. Air intake; 19. Front landing gear strut in retracted position; 20. Cockpit canopy; 21. Heat exchanger and air conditioner; 22. Tubes for delivery of cold air to heat exchanger; 23. Ultrashortwave and homing station antennas; 24. First stage of engine fan; 25. Engine; 26. Front engine nozzles; 27. Rear engine nozzles; 28. Front fuel tank; 29. Aden cannon; 30. Ejection chute for links and cases; 31. Ammunition box; 32. Central fuel tanks; 33. Wing tanks; 34. Rear fuselage tank; 35. Main, two-wheeled landing strut; 36. Upper and lower vibration-damping devices; 37. Receiver of TACAN navigation system; 38. Identification equipment; 39. Hydraulic control boosters for automatic stabilizer and automatic pilot; 40. Back-up ultrashortwave radio; 41. Ultrashortwave transceiver; 42, 43, 44. Short-wave radio equipment; 45. Air speed pump manifold; 46. Rear compartment of air conditioning system; 47. Heat exchangers; 48. Compressed air outlet; 49. Short-wave radio antenna; 50. Equipment for warning pilot of irradiation by enemy radar; 51. Temperature transmitter; 52. Ultrashortwave radio antenna; 53. Back-up antenna for ultrashortwave; 54. Identification antenna; 55. Plastic tail bumper; 56. Elevator member with honeycomb filler; 57. Pitch and yaw control valve; 58. Stabilizer; 59. Magnetic compass; 60. wing; 61. Ailerons and flaps; 62. Aileron actuator; 63. Air delivery line for list control valve; 64. List control valve; 65. Auxiliary struts in retracted position (in the wingtip fairings); 66. Navigation lights; 67. Inside underwing pilon; 68. Releasable fuel tanks; 69. Outside underwing pilon; 70. Sidewinder guided missile.

The aircraft's power unit consists of a Pegasus-Mk104 TRDD [turbojet bypass engine] (maximum static thrust, 9,750 kilograms), which is similar in design to the engine on the Harrier-GR.3 aircraft. Corrosion-resistant materials and coatings

were extensively used in it. The fuel is housed in five fuselage tanks and two wing tanks with a combined capacity of 2,865 liters. A 455- or 1500-liter fuel tank, which is discarded in flight, can be suspended from each of the inside underwing pilons. The aircraft is equipped for aerial refueling.

The armament is housed in seven suspension assemblies--four underwing and three ventral assemblies. The inside underwing assemblies are designed to carry a maximum of 910 kilograms; the outside assemblies, 295 kilograms; the central ventral assembly, 455 kilograms; and two Aden 30 mm cannons are suspended on outer ventral assemblies.

According to information published in the foreign press the Sea Harrier-FRS.1 aircraft (Figure 2 [figures 2,3 not reproduced]) has the following basic features.

Maximum take-off weight, kilograms:
- with short take-off run--11,400
- with vertical take-off--8,600

Weight empty, kilograms--5,770

Payload weight, kilograms:
- maximum--3,600
- normal--2,270

Fuel supply, liters:
- inside tanks--2,870
- two suspended tanks--910 or 3,000 (for ferrying flight)

Flight speed near ground, kilometers per hour:
- maximum--1,180
- cruising--650-830

Combat range, kilometers:
- intercepting air targets--750
- for striking ships and shore targets--460

Ferrying range, kilometers--3,700

Service ceiling, meters--15,250

Main dimensions, meters:
- length--14.5
- length with nose fairing folded--12.7
- wing span--7.7
- height--3.7

The british experts consider the aircraft's most important mission to be that of providing the ship formations with anti-aircraft protection by intercepting enemy aircraft from alert status on the aircraft carriers or from air patrols. For this purpose it is outfitted with Blue Fox multipurpose radar, which makes it possible to employ "air-to-air" and "air-to-surface" guided missiles, and with other, improved radioelectronic equipment. The airborne sighting and navigation system for controlling the weapons includes a gyroscope-stabilized platform, which can be put into place on the aircraft carrier in around 2 minutes, an indicator which displays data against the front glass, and an electronic computer. The design and shape of the fuselage nose have been altered to accomodate the radar antenna system. The nose fairing is turned down to reduce the length of the aircraft when parked on the aircraft carrier. The pilot's field of view from the cockpit has been improved for engaging in aerial combat by raising the seat 0.28 meter and increasing the glass-covered area of the canopy. An improved Martin Baker-10 ejection seat has been installed on the aircraft, which causes the parachute to open 1.5 seconds after the ejection button has been pushed (instead of 2.5 seconds).

Two American Sidewinder guided missiles with an infrared guidance system and two Aden 30mm cannons are used on the aircraft for combatting enemy aircraft. The

AIM-9L Sidewinder guided missiles can destroy air targets not only from the rear but from the front half-sphere as well. It is planned to arm the Sea Harrier with the British Skyflash all-weather, medium-range guided missile. It is believed that with two Sidewinder missiles and the cannons the aircraft can patrol within a radius of 185 kilometers for 1.5 hours (including a 3-minute air battle).

The "air-to-air" guided missiles are designated for destroying enemy surface ships, and various bombs and guided airborne free-flight missiles are to be used for destroying coastal targets. Among other things, it is planned to outfit the aircraft with Sea Eagle antiship missiles. The aircraft is guided to the target by the TACAN navigation system, which determines the aircraft's position after 50 minutes of flight within 2.8 kilometers for distance and 0.5 degrees for course.

According to the British press the Sea Harrier's turbofan engine with variable thrust vector in flight gives it a number of advantages over other fighters for engaging in close aerial combat. Rapid braking achieved by altering the engine's thrust vector greatly enhances its maneuverability. Furthermore, it uses considerably less fuel in aerial combat with great accelerations than other fighters, whose engines use afterburners for such accelerations.

Studies carried out in 1977 showed that the use of a ramp for taking off from the ship's deck makes it possible to shorten the take-off run, increase take-off weight with the same take-off run or retain the same take-off weight and leave the deck at lower speeds. It has therefore been decided to equip the Invincible aircraft carrier, which has already been commissioned, with a ramp inclined 7 degrees (the ramp is 1.98 meters high and provides for a take-off run of 90 meters). The Illustrious aircraft carrier is already equipped with such a ramp. On the aircraft carrier Hermes the ramp has been installed at an angle of 12 degrees and is 4.57 meters high. The ramp on the aircraft carrier Ark Royal will have the same angle. The 12 degree incline is considered optimal for this class of aircraft carriers and its effectiveness drops sharply at greater angles. The installation of the ramp at a 7 degree angle on the Invincible and Illustrious was necessitated by the fact that at greater angles it interferes with the firing of anti-aircraft missiles.

The so-called HQ 899th Air Squadron, consisting of eight aircraft, was formed at Yeovilton Air Base at the end of 1979. The 800th and 801st Air Squadrons were formed in April of 1980 and February of 1981. They are based respectively on the aircraft carriers Hermes and Invincible (with five Sea Harrier planes and nine Sea King ASW helicopters on each).

The command of the 899th Air Squadron is responsible for training flight personnel for the combat squadrons and helping with the flight testing of the aircraft, which is conducted jointly by the Ministry of Defense and the developing company, British Aerospace.

According to the foreign press the program for training flight personnel includes flights on the following types of aircraft: the Bulldog piston aircraft (75 hours), the Jet Provost, the main jet trainer (135 hours), the improved Hawk combat training aircraft, including practice in piloting techniques (85 hours) and employment of the airborne weapons (50 hours) and the Harrier (27 hours), as well as the Harrier-T.Mk4 and Sea Harrier (90 hours).

Approximately 460 hours of flight time, or 987 days, are used for training a pilot. At Yeovilton Air Base the pilots learned to take off from a ramp on the ground and how to engage in close aerial combat, using the jet deflection system for altering the thrust vector. In addition, extensive use has been made of trainers for the Harrier and Sea Harrier aircraft.

Initially, in the phase of mastering the piloting of the Sea Harrier aircraft, pilots who had already flown the F-4 Phantom and Buccaneer jet aircraft were selected for the training. They required only 2 weeks of training. Pilots with experience only in flying helicopters or individuals without experience are now being selected for the school. Both groups take the full course of training.

Initially, after the aircraft were redeployed on the aircraft carrier Invincible, the personnel performed only vertical take-offs and landings. Take-offs from an inclined ramp (Figure 3) with various wind directions and speeds over the flight deck and with various payloads were begun in November of 1980.

Prior to take-off the aircraft is retained at the starting point by a special retaining and shock-absorbing device, which permits the pilot to check the engine's accelerating capacity for 4 seconds and begin the take-off run at maximum thrust. This gives the aircraft the essential take-off speed when it leaves the ramp. At this moment the jets are angled around 50 degrees, the angle of attack is 12 standard units, and the rate of climb is 5.0-6.5 meters per second (adequate for the aircraft's transition to vertical flight). Vertical speed drops to 1.5 meters per second, however, as a result of the fact that the speed is less than that at which the net lifting force, which is the sum of the vertical lifting force and engine thrust components, is less than the weight of the aircraft. This, in turn, results in the aircraft's instantaneous subsidence. As vertical speed increases, the pilot gradually reduces the deflection angle of the jets and finally brings the aircraft into horizontal flight mode. Minimal rate of climb is ordinarily achieved at a speed of 230 kilometers per hour, and the aircraft is taken into horizontal flight at a speed of around 300 kilometers per hour. Ramp take-off significantly increases the pilot's safety, since he has 6.5 seconds of time in case the jet rotating mechanism should malfunction, but only 2.5 seconds in a conventional take-off from a flight deck.

No matter what the wind direction is, the aircraft makes only vertical landings on the aircraft carrier due to the inadequate length of the flight deck. In the daytime with good visibility landing approaches are made from the stern from an altitude of 300 meters and at an indicated airspeed of 480 kilometers. The pilot lowers the landing gear and flaps, deflects the engine jets 20 degrees and checks the functioning of the control valves for pitch, bank and yaw. After selecting the heading to the ship, he gradually increases the angle of the jets and hovers at an altitude of 30 meters (about 12 meters above the deck) approximately 9 meters from the left side of the ship. After making certain that the landing spot marked on the flight deck is clearly visible, the pilot descends and makes the landing.

When making a landing in inclement weather, day or night, the aircraft can be put onto a glide path angling 3 degrees from an altitude of 300 meters and a distance of 6,000 meters to an altitude of 60 meters and a distance of 1,480 meters

with the aid of shipboard facilities, specifically the 1006 navigational radar. The radar operator reports the azimuth, distance to the ship and flight altitude to the pilot for adjusting the glide path. Landings can also be made using the airborne Blue Fox radar, which generates data on the aircraft carrier's location in real time and feeds it into the aircraft navigation system, as well as such data as the flight azimuth, range and altitude as depicted on the pilot's optico-electronic indicator.

Sea Harrier aircraft took part in combat operations in the South Atlantic as part of the Expeditionary Corps. The foreign press has stated that at the beginning of the Anglo-Argentine conflict 20 Sea Harriers were based on the ASW aircraft carriers Invincible and Hermes. The British subsequently moved another 50 aircraft to the area: eight Sea Harriers and 42 Harrier-GR.3 aircraft (from the Air Force), hastily modified for operating from ships. They were delivered both on civilian vessels specially adapted for the purpose and by air, with aerial refuelings and using an intermediate air base on Ascension Island.

According to the British press, the Sea Harrier aircraft mainly provided air defense for their task force. A total of 2,000 combat sorties were made. The aircraft were about 90 percent combat-ready. Improved AIM-9L Sidewinder guided missiles with an infrared guidance system were the main weapon used for combatting aircraft of Argentina's Air Force. In addition, after the conflict had already begun, Sea Harrier aircraft were equipped with passive and active equipment for jamming the enemy's radar. According to the British press, all of this in combination with the conduct of high-maneuverability aerial combat enhanced the aircraft's combat capabilities. During the military operations Sea Harriers shot down 31 aircraft of the Argentine Air Force, while the British lost eight of their own aircraft. Great Britain's Navy is purchasing 14 Sea Harrier aircraft to replace them.

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SATELLITE COMMUNICATION STATIONS OF THE U.S. NAVY

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 83 pp 65-68

[Article by Capt 1st Rank (Reserve) A. Markov: "Satellite Communication Stations of the U.S. Navy"]

[Text] The U.S. Navy is continuing to improve its command and control and communication systems. These include the satellite systems, which make it possible to maintain reliable and practical, instantaneous communications at any distances, in any season, at any time of day. The satellite communication system includes terminal stations in addition to the satellites themselves. At the present time the U.S. Navy is using more than 10 kinds of these stations, which are installed at coastal communication centers, on ships and aircraft. The tactical and technical characteristics of the main stations are given in the table.

The AN/FSC-79 stationary coastal transmitting station (a modernized version of the Army's AN/MSC-60 satellite communication station) is used in the Navy for sending circular "fleet" transmissions. It is a complex technical installation providing good communication stability. These stations are located at the main district communication centers of the U.S. Navy in the cities of Norfolk, Honolulu, Neapolis and on the island of Guam (for the 2nd, 3rd, 6th and 7th fleets respectively).

The printing system is mainly used for the circular transmissions, while they are sent in digital form on individual channels. The carrying capacity of the station makes it possible to send a considerable volume of information at a speed of up to 2,400 bits per second. The satellite's relay unit converts signals received in the centimeter band into ultrashortwave signals.

Circular transmissions are received on all classes of ships with the AN/SSR-1 receiver (Figure 1 [figures not reproduced]). It operates round-the-clock in the printing mode, receiving at a speed of 75 bits per second on any one of 15 fixed working channels, which use frequency and phase modulation with a band width of 25 kilohertz. The receiving device uses a power of no more than 100 watts. Its antenna system consists of four latticed dipole antennas with an active section 390 mm long (total length of each antenna is 680 mm). The antennas are set up at the highest points on the superstructures and masts to provide for the accurate reception of satellite signals on any course traveled by the ship.

MAIN TACTICAL AND TECHNICAL CHARACTERISTICS OF SATELLITE COMMUNICATION STATIONS OF THE U.S. NAVY

Тип станции (1)	Назначение (2)	Антенная система (диаметр, м) (3)	Диапазон частот, МГц (4)	Количество каналов связи (5)	Мощность передатчика, Вт (6)	Вес, кг (7)
AN/FSC-79	(8) Береговая передающая станция циркулярных передач	(9) Параболический отражатель (18,3)	7900—8400	48	10 000	180 000
AN/SSR-1	Корабельный (10) приемник циркулярных передач	(11) Комбинированная, скрещенные диполи	243—270	1	—	•
AN/WSC-2	Приемопередающая станция флагманских кораблей (12)	Параболический (13) отражатель (2,44)	7250—8400	2—3	9000	4100—5755
AN/WSC-3	Основная приемопередающая (14) станция кораблей флота	Широкодиапа- (15) зонные диполи с плоским рефлектором (1,2)	225—400	1	100	64,4
AN/WSC-5	Приемопередающая станция береговых узлов связи и флагманских кораблей (17)	То же (16)	225—400	8 и 4	•	•
AN/ARC-143B	Самолетная станция (на (18) Р-3С «Орион»)	Комбинированная многопрофильная (19)	225—400	1	100	16,1
AN/ARC-156	То же (на S-3A «Викинг») (20)	Перекрещивающиеся диполи (21)	225—400	1	100	•
AN/PSC-1	Носимая станция (22)	Прямоугольный сетчатый отражатель (0,9) (23)	225--400	1	35	11,3

KEY:

1. Type of station
2. Purpose
3. Antenna system (diameter, m)
4. Frequency range
5. Number of communication channels
6. Transmitter power, watts
7. Weight, kilograms
8. Coastal circular transmission station
9. Parabolic reflector
10. Shipboard circular transmission receiver
11. Combined, latticed dipoles
12. Flagship transceiver station
13. Parabolic reflector
14. Main transceiver station for ships of the fleet
15. Broad band dipoles with flat reflector
16. The same
17. Transceiver station for coastal communication centers and flagships
18. Airborne station on P-3C Orion
19. Combined, multiple-section
20. The same, on the S-3A Viking
21. Intercepting dipoles
22. Portable station
23. Rectangular reticular reflector

The receiver is also adapted for installation at coastal communication centers and on mobile facilities of the Marines which receive circular transmissions on the satellite channels.

The first AN/WSC-2 satellite communication stations of the DSCS system were received by the flagships, mainly aircraft carriers and guided missile cruisers, in 1976. With these facilities the ships maintain reliable communication among themselves and with headquarters ashore over considerable distances. Three models of this station--large, medium and small--were developed for ships with large, medium and small displacement. These differ little in size and weight, however.

A station consists of six racks arranged in a separate, specially equipped room. Total power requirement is 41.1 kilowatts. The foreign experts consider the antenna system to be inconvenient for use on ships. The diameter of its parabolic reflector is 2.44 meters (the large station) and 1.22 meters (the medium and small stations). The antenna is aimed at the satellite by means of cumbersome automatic and manual tracking units. It is kept in a horizontal position by means of a pitch compensation system.

Most of the U.S. Navy's surface ships and submarines are equipped with the AN/WSC-3 (Whiskey-3) standard ultrashortwave transceiver for maintaining two-way communication with shore through a relay satellite in the ultrashortwave band. In recent years it has begun to be installed on light ships and auxiliary vessels. Its dimensions (31.1X57.2X48.1 cm) and operating mode make it possible to install the station in standard ship compartments and on mobile transport units of the Marines. It has also been installed on many ships of the naval forces of nations forming the military blocs created by the United States.

The AN/WSC-3 is used by both satellite and conventional ultrashortwave radio stations for effecting communication within zones of direct visibility (at the tactical level). Because of this most of the ultrashortwave radio stations previously in use have been replaced with it. The station can operate on one of 7,000 frequency channels with a transmission band of 25 kilohertz (with preliminary adjustment for 20 of them) and provides for all types of transmissions with amplitude, frequency and phase modulation at speeds of 75-9600 bits per second. Telephone, telegraph and facsimile devices and electronic computers of automated control systems serve as the terminals. With switching and the replacement of individual assemblies it can be used for sending broad-band and narrow-band transmissions. The modular construction of the station and a built-in system for monitoring the functioning of the blocks make it possible to rapidly find and correct malfunctions by replacing modules.

Out of the AN/WSC-3 the Collins company developed the large AN/WSC-5 transceiver for flagships and coastal communication centers. The shipborne model has four transceiver channels; the coastal model has eight. Additional sets of equipment can be installed on ships and at the coastal centers as the number of subscribers grows. The main operating features of the large shipborne station are similar to those of the basic AN/WSC-3 model, but it differs in the power of its transmitter and its dimensions.

The AN/WSC-6 is a further development of the AN/WSC-2 station, with the deficiencies of the latter eliminated. A model has also been developed for various classes of ships, in which the dimensions and weight have been reduced while retaining the transmitter's 9-kilowatt power. The transmitter's functioning is controlled by a microprocessor. The parabolic antenna, which has a diameter of 1.2 meters, is equipped with an automatic system for directing it toward the satellite. The station can receive and transmit information at a speed of 75-2400 bits per second. The foreign press reports that all new ships designated for use as flagships will be outfitted with the AN/WSC-6. It has already been installed on certain aircraft carriers. The fact is underscored that industry will deliver around 40 such stations to the Navy.

The shipborne equipment for satellite communication in the centimeter band continues to be modernized. The new generation AN/WSC-7 station is being created, for example, for operating in the centimeter and millimeter bands. Various existing modules and modules under development under order from the U.S. Defense Department will be used in them. Enhancing communication stability in situations involving radioelectronic warfare is one of the main directions for the improvement of this type of equipment. For example, it is planned for the new station to have a large number of fixed frequencies with intermittent switching from one to another during operation, as well as a millimeter band in preparation for the use of future communication satellites which will relay transmissions in this wave band. According to reports in the American press space is being reserved on ships presently under construction for the installation of the AN/WSC-7 station.

Special ultrashortwave transceiver stations operating in the 225-400 megahertz band are being developed for communication between aircraft of the naval aviation and ships and coastal centers. With these stations communication can be maintained both within zones of direct visibility and beyond these zones through relay facilities on ISZ [artificial earth satellites). They operate with antennas installed inside the aircraft fuselage, which are a combination of individual antennas with a directional pattern in the form of a half-sphere. This makes it possible to receive transmissions from a satellite without tracking it. The radiating antenna necessary for a transmission is selected automatically. Communication by means of these stations can be effected in flight or while the aircraft is parked at an airfield or on an aircraft carrier.

At the present time, the American press reports, only two types of aircraft use satellite communication facilities--the P-3C Orion coastal patrol aircraft (the AN/ARC-143B) and the deck-based S-3A Viking ASW aircraft (the AN/ARC-156).

The AN/ARC-143B is a single-channel transceiver which operates on any of 7,000 fixed frequencies in the ultrashortwave band. Frequency and phase modulation are used for telephone and teletype communication. In addition, when operating as a conventional ultrashortwave station, the reception and transmission can be effected in the telephone mode with amplitude modulation or in the digital telephony mode. It can also transmit information from automated control systems (ASU). A communication channel with a transmission band of 25 kilohertz using the modem of an automated control system makes it possible to transmit at the speeds used in the transmission lines of the given automated control systems. With amplitude modulation the transmission power is 30 watts. It is 100 watts with other types of modulation and for operating in the communication satellite mode. The station is 15.2X19.6X64.8 cm and weighs 16.1 kilograms.

The AN/ARC-156 is also a single-channel transceiver with the same operating modes as those described above, but with certain technological differences in the arrangement of the antenna system.

Two special sets of satellite communication equipment have been developed for controlling landing forces, which ordinarily operate in theaters lacking engineer preparation: The AN/TSC-89 transported system was developed for naval landing subunits and is mounted on a single-axle trailer towed by a jeep (Figure 3); the

AN/TSC-96(V) was developed for airborne subunits and is mounted on two trailers delivered to the landing area by helicopter. The foreign press reports that both systems include three standard AN/WSC-3 shipborne radar sets, electric power and other auxiliary equipment. With these systems the command elements of the main landing subunits can maintain reliable communication with the interacting amphibious ships, landing, fire and air support forces and subordinate units of the landing force.

The AN/PSC-1 satellite communication equipment developed for the U.S. ground forces is used in the lower subunits of the Marines (Figure 4). This portable pack-type set, which is 7.9X17.8X29.2 centimeters and weighs 5.2 kilograms without the battery, can be used for telephone conversations. A 5 kilohertz transmission band is used for communicating by means of artificial earth satellites, and 25 kilohertz within the zone of direct visibility. Digital transmissions can be made at a speed increased to 2,400 bits per second on a narrow-band channel by means of a special device.

The equipment uses a 24 volt electric battery, sufficient for operating in the constant duty reception and transmission mode (9:1) for a period of 12 hours. The antenna, which has a reflector of 4.9 square decimeters, emits a 35 watt signal for satellite communication and a 2 watt signal for conventional communication (with a rod antenna). It is reported that no more than 2 minutes is required to ready the equipment for use.

In the assessment of command, the terminal equipment in use in the American Navy needs a number of major improvements. Work is reported to be underway to adopt the millimeter wave band for satellite communication. This will make it possible to resolve the problem of transmitting a large volume of information, enhancing the resistance of the communication lines to interference and reducing the dimensions of the equipment. Special attention is being given to reducing the cost of the shipborne satellite communication equipment. The incorporation of less refined qualitative indices is one of the ways by which the terminal equipment is being made less expensive. This is to be compensated for with artificial earth satellites on which it is planned, among other things, to increase the size of the antennas and the power of the relay units.

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OCEANOGRAPHIC AND SURVEY VESSELS OF THE U.S. NAVY

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[Article by Eng-Capt 1st Rank (Reserve) M. Tsiporukha: "Oceanographic and Survey Vessels of the U.S. Navy"]

[Text] Oceanological studies have assumed great scope in the USA in recent decades. The Navy command feels that the results of these studies will have a significant effect upon the development of modern ASW forces, means of support for their combat operations and the fleet of nuclear-powered missile submarines.

In order to enhance effectiveness in the use of the ASW forces the Navy leaders are devoting special attention to the study of the physical parameters underwater, the speed and the nature of the dissemination of sound vibrations at various depths, the elements of underwater currents, the borders of strata between which there are jumps in temperature, the reflecting properties of these strata and various types of bottom, and the interface between the air and water environments.

It is demonstrating special interest in the study of conditions exerting an influence with respect to increasing submarine detection range and to the identification of possibilities for reliably forecasting these conditions. Studies are therefore being made of the influence of water salinity, density and temperatures, as well as the ocean flora and fauna upon the functioning of detection facilities, and the nature of the tracking signs generated by submarines and their capacity for penetration and dissemination in ocean water, as well as sonic, thermal, light and radio waves in various ranges.

The comprehensive study of all strategically important areas of the World Ocean is being developed more and more extensively in the USA, including oceanological (hydrological), geophysical, hydroacoustic, hydrographic (sounding studies with detailed surveying of the bottom topography), geological, meterological investigations.

According to the Western press, outlays for ocean study programs are constantly growing and reached 1 billion dollars annually by the end of the 1970s.

U.S. naval experts maintain that although possibilities for collecting oceanological data with automated equipment installed on oceanographic buoys, aircraft and

spacecraft have increased considerably in recent years, survey and hydrographic vessels outfitted with scientific equipment will remain the main means of performing oceanological studies for the next 15 to 20 years. The equipment is being made more effective with systems for collecting, recording and processing scientific information, which include shipborne electronic computers.

In 1981 the U.S. Navy Oceanography Service was using 13 scientific research vessels: six vessels specially designed for oceanological research and seven multipurpose survey vessels designed also for deep-sea exploration. A total of 80 million dollars was allocated for their operation in fiscal year 1982 alone. In addition, this service has six vessels of command's electronic systems at its disposal (three cable-layers and three survey vessels).

Due to the constantly increasing volume of research the U.S. Navy command is actively enlisting nonspecialized vessels for this work. These are primarily Coast Guard ice-breakers, including the latest Polar Star and Polar Sea, on each of which six laboratories have been set up, including a meterological laboratory, an oceanological information processing center, a photolaboratory and so forth.

Vessels of more than 40 government organizations not a part of the Defense Department, as well as universities and private companies, take part in the oceanological research. The National Oceanic and Atmospheric Administration (NOAA) interacts most closely with the Navy. According to the Western press its subdivision--the National Ocean Survey (NOS)--had 25 vessels with a displacement of over 500 tons in 1980. The larger vessels (800-1,000 tons) are used in deep-sea areas of the World Ocean, while the smaller vessels are used in areas of the continental shelf and slope.

Most of these vessels have special equipment for performing comprehensive oceanological investigations and survey work, including equipment for compiling naval maps, testing equipment for new navigational systems (including satellite systems) and studying the ocean's biological and mineral resources. They have been used for studying water circulation in the equatorial zone of the Pacific Ocean and the Central Atlantic and the dynamics of the earth's crust in active seismic areas of the oceans and along the U.S. coast, and a great deal more.

These vessels have now served 15 years. According to the American press, a program has been worked out and is being implemented for repairing them and outfitting them with the latest scientific equipment, which will keep the vessels in service until the end of the 1990s.

The scientific research vessels of universities with oceanological departments and laboratories play a significant role in the oceanological research. Toward the end of the 1970s they had 31 survey vessels. Projects carried out by the American universities in great part have an applied military focus, and up to 70 percent of the funds granted to them comes from government establishments. The university heads typically strive vigorously to get the state agencies to increase allocations for maintaining the vessels so that maximum use can be made of them for their direct purpose in the ocean.

MAIN TECHNICAL CHARACTERISTICS OF OCEANOGRAPHIC AND SURVEY VESSELS OF THE U.S. NAVY

Тип, год постройки (переоборудования) (1)	(2) Количество в серии	Основные размерения, м: длина ширина осадка (3)	(4) Полное водоизмещение, т	(5) Тип ГЭУ	мощность, л. с. (количество винтов) (6)	(7) Скорость, уз: полная	экономическая (8)	(9) Дальность плавания, тыс. миль	автономность, сут (10)	(11) Экипаж (научные сотрудники), человек	(12) Количество лабораторий	(13) площадь, м²
«Элтэнин»[1], 1957 (1961) (14)	2	60,0 16,0 5,9	3480	(15) Дизель-электрическая	2700 (2)	12	10	10	.	56 (15)	4	.
«Боудич»[2], 1945 (1958) (17)	2	138,7 19,0 7,6	13 050	(16) Паротурбинная	8500 (1)	17	9	8	30	100 (40)	8	.
«Роберт Д. Конрад», 1962 (18)	7	63,7 12,2 4,7	1370	Дизель-электрическая	1000 (1)	13.5	12	12	30	41 (15)	3	110
«Шовинет», 1970 (20)	2	120,0 16,5 4,9	3670	(19) Дизель	3600 (1)	15	12	15	90	175 (12)	8	385
«Мелвилл», 1969 (21)	2	75,0 14,0 4,6	1915	Дизели	2500 (2)	12	10	10	60	50 (25)	4	310
«Хейз»[3], 1971 (22)	1	75,0 22,9 6,7	2876	Дизели	5400 (2)	15	13,5	6	30	74 (30)	8	708
«Силас Бент», 1965 (23)	4	87,0 14,6 4,6	2580	Дизель-электрическая	3000 (1)	15	12	12	60	78 (30)	5	155
«Хесс», 1978 (24)	1	163,3 23,2 12,5	22 625	Паротурбинная	19 250 (1)	20	15	8	30	57 ([illegible])	.	.

1. Modified transports for hauling dry cargo in ice conditions.
2. Modified transports of the Victoria class.
3. Catamaran.

KEY:
1. Type, year built (modified)
2. Number of vessels in series
3. Main measurements: meters length, width, draught
4. Total displacement, tons
5. Type of main power plant
6. Power, hp (number of propellers)
7. Full speed, knots
8. Economical speed
9. Range, thousands of miles
10. Autonomy, days
11. Crew (scientific associates)
12. Number of laboratories
13. Area, square meters
14. (Eltenin)
15. Diesel-electric
16. Steam-turbine
17. Bowditch
18. Robert D. Conrad
19. Diesel
20. Chauvinet
21. Melville
22. Hayes
23. Silas Bent
24. Hess

The number of the fleet's vessels belonging to private companies has increased in recent years. They are primarily used for jobs involved in developing deposits of oil, gas and other minerals along the continental shelf. At the same time, geological research and the surveying of the ocean floor, as well as deep-sea projects of various kinds, are performed by private companies frequently with financial assistance from the Navy. In such cases all of the research and

development results are used for the Navy. The backbone of the U.S. Navy's oceanographic fleet is made up of multipurpose scientific research vessels built in the 1960s and '70s (Figure 1[figures not reproduced]). According to a foreign press report the U.S. Navy is not planning to build new vessels in the next 5 years, while it is planned to make effective use of existing vessels by periodically modernizing the scientific and other equipment or replacing it with improved equipment.

The main characteristics of oceanographic and survey vessels of the U.S. Navy are given in Table 1, and those of standard vessels of U.S. govermental establishments, universities and private companies involved in oceanological research for the Navy are given in Table 2.

Most of the modern scientific research vessels in the USA are equipped with helicopters and survey boats. Many of them have trunks inside the hull for lowering scientific instruments into the water; stabilizers; bow maneuvering devices making it possible to hold the vessel broadside to the waves, which is especially important for setting up buoy stations; ∩-shaped frames; deep-sea winches and cranes. From seven to ten scientific laboratories are set up on the vessels. The modern oceanographic vessels have a range of 10,000-15,000 miles or more and a speeds ordinarily not exceeding 12-14 knots.

In addition to the conventional single-hull, water-displacing oceanographic vessels, catamarans of various types have made their appearance in the USA in recent years. They have a number of important advantages over the single-hull vessels. A large quantity of bulky equipment can be easily installed on the relatively large upper deck. Catamarans have better navigational capabilities (this is especially important when using high-precision geophysical instruments), greater stability and better controllability. An oceanographic vessel must have good controllability to provide more convenient and safer conditions for lowering the equipment into the water.

On the Hayes catamaran, for example, it has been possible to install scientific research laboratories with a total area of 700 square meters, which is twice the amount which can be set up on a single-hull vessel of equal displacement. It has a considerable quantity of research equipment, various types of oceanographic winches and a crane with telescopic jib, which can lift 23 tons with the jib extented to around 5 meters.

The oceanographic and survey vessels are ordinarily equipped with improved navigational and scientific research equipment for comprehensive oceanological studies. With the navigational equipment installed on a vessel its location can be determined to within a few hundred or even a few dozen meters at any time of day and in practically any area of the World Ocean. Navigational instruments manufactured by the Magnavox company in the USA, for example, make it possible to determine the location with comprehensive data from the Transit satellite navigational system and the Omega radar system.

Navy oceanographic vessels have begun using laser range finders designed for determining the distance to various objects during the course of oceanological and meterological observations.

Table 2. Main Characteristics of Vessels of the National Oceanic and Atmospheric Administration, Universities and Private Companies Performing Research for the U.S. Navy

(1) Наименование, год постройки	(2) Основные размерения, м: длина ширина осадка	(3) Полное водоизмещение, т	(4) Тип ГЭУ / (5) мощность, л. с. (количество винтов)	(6) Скорость, уз: полная / экономическая	(7) Дальность плавания, тыс. миль / автономность, сут	(8) Экипаж (научные сотрудники), человек	(9) Количество лабораторий / площадь, м²	(10) Принадлежность
«Сервейер», 1960 (11)	89,0 14,0 5,49	3960	(12) Паротурбинная / 3100 (1)	15 / 13	10.5 / 90	92 (16)	.	(13) Национальное управление по исследованию океана и атмосферы
«Оушено-грейфер», 1966 (14)	92,0 16,0 5,5	3959	(15) Дизель-электрическая / 5000 (2)	16 / 14,5	16 / 35	107 (18)	5 / 390	То же (16)
«Ресерчер», 1970 (17)	85,0 16,0 5,5	3600	Дизель-электрическая / 3300 (2)	14 / 12	13 / 35	82 (13)	4 / 302	»
«Гломар Челленджер», 1968 (18)	123,0 19,8 6,1	10 800	Дизель-электрическая¹ / 10 000² (2)	12,5 / •	• / 90	46 (22)	6 / •	(19) Частная компания «Глобал Марин»
«Викома», 1975 (20)	54,0 10,0 5,2	962	(21) Дизели / 1400 (2)	15 / 10	7.2 / 30	12 / 16	2 / 93	•
«Эндевор», 1976 (22)	54,0 10,0 5,3	972	Дизели / 1400 (2)	15.3 / 13	9.2 / 30	12 / 16	4 / 93	•
«Нью Хорайзн», 1979 (23)	51,8 11,0 3,7	600	Дизели / 1700 (2)	12.3 / 10,5	7 / 24	12 / 13	4 / •	(24) Калифорнийский университет
«Риджели Ворфилд», 1969 (25)	32,3 10,0 2,3	162	Дизели / 2400 (2)	18	1.0 / 30	10 / 8	2 / 40	Университет Гопкинса (26)

1. Unified electric power plant.
2. Power of electric propeller engines, 3,300 kilowatts.

KEY:
1. Name, year built
2. Main measurements, meters: length, width, draught
3. Total displacement, tons
4. Type of main power plant
5. Power, hp (number of propellers)
6. Full speed, knots/ economical speed
7. Range, thousands of miles/ autonomy, days
8. Crew (scientific associates)
9. Number of labs./ area, square m
10. Owner
11. Surveyor
12. Steam-turbine
13. National Oceanic and Atmospheric Administration
14. Oceanographer
15. Diesel-electric
16. The same
17. Researcher
18. Glomar Challenger
19. Private company, Global Marine
20. (Vikoma)
21. Diesels
22. Endeavor
23. New Horizon
24. University of California
25. Ridgeley Vorfield
26. Hopkins University

The Western press states that in the USA a great deal of attention has been devoted in recent years to the outfitting of oceanographic vessels with new facilities for studying the topography of the ocean floor: deep-sea precision echo sounders for measuring depths up to 11,000 meters, echo sounders for measuring shallow depths and equipment for surveying the microtopography of the floor. A shipborne system for the optical charting of the floor in real time and with a high degree of discrimination has been developed and is being tested at sea. It employes the 3-dimensional scanning principle, which allegedly makes it possible to reduce the harmful effects of back scattering. An argon laser is used as the source of lighting for the system. Its mechanical scanning provides coverage within a 120 degree angle with a scanning strip 122 meters wide. It is reported that the entire unit is housed in a shell made of transparent acrylic plastic.

Acoustic survey systems which make it possible to automatically obtain depth charts (isobaths) have come into widespread use.

High-precision ocean gravimeters on hydraulic stabilizing platforms and precision proton ocean magnetometers are used on the oceanographic vessels for studying geophysical fields.

In the oceanological studies extensive use is made of bathythermographs, deep-sea thermometers and equipment for determining the speed of sound in ocean water, the speed and direction of the current at various levels, the transparency and the color of ocean water and the parameters of turbulence and the diffusion of light, and other instruments. Equipment which automatically transmits information through cables to a scientific information collection system on board the vessel is mainly being used today. This is making it possible to increase the speed of accumulation of scientific information many times over, compared with equipment which only registers the data, since there is almost no need now to bring the equipment on board for each registration operation.

For studying the soil of the ocean floor and sedimentary rock the oceanographic vessels are equipped with improved tubes for taking soil samples from any depth and with seismic profilographs making it possible to register the configurations of bottom sediment and bedrock.

Most of the oceanographic vessels are equipped with devices for lowering radiosondes and receiving scientific information from them. Some of them have equipment for launching meterological rockets for obtaining information on conditions in the higher strata of the atmosphere and in the ionosphere.

The USA is devoting special attention to improving the system for gathering and processing oceanological data. High-speed electronic computers with large memory capacities are being installed on the vessels for this purpose. Reliability and constant readiness for operating on long cruises is achieved by providing the computer centers of the oceanographic vessels with main and back-up equipment. All of the computer equipment is installed on shock-absorbers so that it can function reliably at pitch angles of up to 30 degrees. Emergency power is provided by storage batteries for a period of 2-4 hours after the ship's system has ceased to provide electric power. Electronic computers continuously register data

coming in from the instruments on 30-50 channels. Such automated systems increase many times over the speed at which the incoming data is processed and make it possible to use this data promptly and efficiently for the performance of a broad range of practical tasks.

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